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NASA Goddard Space Flight Center
Greenbelt, Maryland

RAPID SPACECRAFT DEVELOPMENT OFFICE

RAPID III MISSION ASSURANCE REQUIREMENTS (MAR)

MISSION CLASS: D

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Section A. INTRODUCTION

A.1 Scope

This document describes the contract baseline safety and mission assurance requirements for the spacecraft development and related services under the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center (GSFC) Rapid III Spacecraft Acquisition (RSA) Contract. These requirements are defined as “Class D”. (Reference NASA Procedural Requirement [NPR] 8705.4.)

These requirements and the mission class may be modified to meet the mission specific needs of Government projects utilizing this contract. The specific requirements on each mission shall be as defined in the mission specific delivery order (DO).

A.2 Acronyms (Appendix A) and Glossary (Appendix B)

A listing defining the acronyms used throughout this Mission Assurance Requirements (MAR) document and its Appendices is located in Appendix A. Additionally, a glossary defining specific terms used throughout the MAR and its appendices is located in Appendix B.

A.3 Applicable Documents and Forms (Appendix C)

A table of the applicable documents and forms referenced throughout this MAR and its Appendices is located in Appendix C. The table includes each document’s or forms name; document number, revision level, and date; MAR sections or data item descriptions (DIDs) that call-out the document or form; and the document’s or form’s sources (hyperlinks or website locations); plus any applicable notes to the user.

A.4 MAR Data Item Description (DID) List (Appendix D) and MAR DIDs (Appendix E)

A table of the MAR DID List is included in Appendix E. This table includes the DID number, MAR reference paragraph(s), the DID title, the due dates for DID deliveries, and the purpose for each DID delivery. (For additional information, see MAR section 1.5.) Appendix F includes the DIDs referenced in the MAR and beginning with the prefix “MA” (for Mission Assurance).

Section 1 GENERAL

1.1 Systems Safety and Mission Assurance (S&MA) Program

The Contractor shall prepare, document, and implement a Mission Assurance Implementation Plan (MAIP) in accordance with the Statement of Work (DID MA 1-1). The MAIP shall cover:

a. All flight hardware and software that is designed, built, or provided by the Contractor and its subcontractors or furnished by the Government, from project initiation through launch and mission operations.
b. The ground support equipment that interfaces with flight equipment to the extent necessary to assure the integrity and safety of flight items (includes electrical, mechanical, software, and test facilities).

1.2 Management

The Contractor shall designate a manager for assurance activities. The manager shall have direct access to management that is independent of project management and functional freedom and authority to interact with all elements of the project.

1.3 Requirements Flowdown

The Contractor shall apply the MAIP to its subcontractors.

1.4 Suspension of Work Activities

The Contractor shall direct the suspension of any work activity that presents a present hazard, imminent danger, or future hazard to personnel, property, or mission operations resulting from unsafe acts or conditions that are identified by inspection, test, or analysis.

1.5 Contract Data Requirements List

The Contract Data Requirements List (CDRL) identifies DID for delivery to the Government. The Contractor shall deliver data items per the requirements of the applicable DID with all data items due to the Project Office unless a different delivery site/recipient is specifically cited in the CDRL and/or DID. Unless otherwise specified in the DO and with the exception of the Printed Wiring Board Coupons (required by DID MA 12-6), all deliverables shall be provided to the Government in an electronic format agreeable to the Project Office. Unless otherwise specified in the DO, the Contractor may assume that a deliverable is approved by the Government if

no Government comments/feedback are/is officially received from the Project Office within two (2) weeks of the Contractor's delivery of the deliverable to the Project Office.

The Contractor shall perform work in accordance with the following definitions:

a. Deliver for approval: The Project Office approves the deliverable within two (2) weeks before the Contractor proceeds with the associated work.
b. Deliver for review: The Project Office reviews the deliverable and provides comments within two (2) weeks before the Contractor proceeds with the associated work. The Contractor can continue with the associated work while preparing a response to the Government comments unless directed to stop work.
c. Deliver for information: For Project Office information only. The Contractor continues with the associated work.

1.6 Surveillance

The Contractor shall grant access for Government assurance representatives to conduct an audit, assessment, or survey upon notice. The Contractor shall supply documents, records, equipment, and a work area within the Contractor's facilities.

1.7 Use of Previously Developed Product

The Contractor shall document the compliance of previously developed product with the requirements of the MAIP (DID MA 1-1).

Section 2. QUALITY MANAGEMENT SYSTEM

2.1 General

The Contractor shall have a Quality Management System that is compliant with the requirements of Society of Automotive Engineers SAE AS9100, Quality Systems - Aerospace - Model for Quality Assurance in Design, Development, Production, Installation and Servicing, or American National Standards Institute (ANSI)/International Organization for Standardization (ISO)/American Society for Quality (ASQ) Q9001, Quality Management Systems – Requirements, or equivalent. The Contractor shall provide a copy of the Quality Manual to the Government (DID MA 2-1).

2.2 Supplemental Quality Management System Requirements

2.2.1 Control of Nonconforming Product

Control of Nonconforming Product – The Contractor shall have a documented closed loop system for identifying, reporting, and correcting nonconformances. The system shall ensure that positive corrective action is implemented to preclude recurrence, that objective evidence is collected, and that the adequacy of corrective action is determined by audit or test.

2.2.2 Material Review Board (MRB)

The Contractor shall have a documented process for the establishment and operation of an MRB to process nonconformances, including the definitions of major and minor nonconformances. The Contractor shall appoint an MRB chairperson who is responsible for implementing the MRB process and for appointing functional and project representatives as MRB members. The MRB membership shall include a voting member representing the Government Project Office's S&MA Officer. The Government S&MA representative (or a designated alternate) shall be present at all MRB meetings. The Contractor shall inform the Government of MRB actions (DID MA 2-2).

The MRB shall use the following disposition actions:

a. Scrap — The product is not usable.
b. Re-work — The product shall be re-worked to conform to requirements.
c. Return to supplier — The product shall be returned to the supplier.
d. Repair — The product shall be repaired using a repair process approved by the MRB.
e. Use-as-is — The product shall be used as is, processed as Major MRB.

The Contractor shall submit a waiver to requirements for government approval for a use-as-is disposition involving a major nonconformance (DID MA 2-3).

2.2.3 Reporting of Anomalies

The Contractor shall have a documented process for reporting anomalies. The Contractor shall report hardware anomalies beginning with the first application of power at the component level, software anomalies beginning with first use of the flight build software, and mechanical system anomalies beginning with the first operation (DID MA 2-4). The Anomaly Review Board (ARB) membership

shall include a voting member representing the Government Project Office's S&MA Officer. The Government S&MA representative (or a designated alternate) shall be present at all ARB meetings.

Section 3. SYSTEM SAFETY

3.1 General

The Contractor shall document and implement a system safety program in accordance with NPR 8715.3, NASA General Safety Program Requirements; NPR 8715.7, Expendable Launch Vehicle Payload Safety Program; launch service provider requirements; and launch range safety requirements (DID MA 3-1).

Specific safety requirements include the following:

a. The Contractor shall incorporate three independent inhibits in the design (dual fault tolerant) if a system failure may lead to a catastrophic hazard. A catastrophic hazard is defined as a condition that may cause death or a permanent disabling injury or the destruction of a major system or facility on the ground or of the vehicle during the mission.
b. The Contractor shall incorporate two independent inhibits in the design (single fault tolerant) if a system failure may lead to a critical hazard. A critical hazard is defined as a condition that may cause a severe injury or occupational illness to personnel or major property damage to facilities, systems, or flight hardware.
c. The Contractor shall adhere to specific detailed safety requirements, including compliance verification that shall be met for design elements with hazards that cannot be controlled by failure tolerance. These design elements, e.g., structures and pressure vessels, are called "Design for Minimum Risk" areas.

3.1.1 Mission Related Safety Requirements Documentation

The Contractor shall implement launch range requirements. The most stringent applicable safety requirement shall take precedence in the event of conflicting requirements.

a. Air Force Space Command Manual (AFSPCMAN) 91-710, Range Safety User Requirements Manual
b. Kennedy NASA Procedural Requirements (KNPR) 8715.3, KSC Safety Practices Procedural Requirements
c. NPR 8715.7, Expendable Launch Vehicle Payload Safety Program

d. Facility-specific Safety Requirements, as applicable
e. NASA Safety Standard (NSS) 1740.12, Safety Standard for Explosives, Propellants, and Pyrotechnics
f. NSS 1740.14, Guidelines and Assessment Procedures for Limiting Orbital Debris

3.1.2 Payload Integration Facility Requirements

The Contractor shall document and implement procedures that comply with applicable installation safety requirements when performing integration and test activities and pre-launch activities at the launch site (DID MA 3-2). The Contractor shall provide safety support for hazardous operations at the launch site.

For work to be performed at GSFC, the Contractor shall meet the requirements of 500-PG-8715.1.2, the Applied Engineering and Technology Directorate (AETD) Safety Manual.

3.2 System Safety Deliverables

3.2.1 Safety Requirements Compliance Checklist

The Contractor shall prepare a Safety Requirements Compliance Checklist to demonstrate that the payload is in compliance with NASA and range safety requirements (DID MA 3-3). Noncompliances to safety requirements shall be documented in waivers and submitted for approval. (Reference MAR Section 3.2.5.)

3.2.2 Hazard Analyses

3.2.2.1 Preliminary Hazard Analysis (PHA) – The Contractor shall document PHA (DID MA 3-4).

3.2.2.2 Operations Hazard Analysis (OHA) - The Contractor shall document OHA and a Hazard Tracking Log to demonstrate that hardware operations, test equipment operations, and integration and test (I&T) activities comply with facility safety requirements and that hazards associated with those activities are mitigated to an acceptable level of risk (DID MA 3-5). The Contractor shall maintain and update the Hazard Tracking Log during I&T activities to track open issues.

The Contractor shall meet the safety requirements of NASA-Standard NASA-STD-8719.9, Standard for Lifting Devices and Equipment, when NASA-owned or NASA contractor-supplied equipment is used in support of NASA operations at NASA installations.

The Contractor shall meet the safety requirements of NASA-STD-8719.9 when performing NASA work at contractor facilities.

3.2.2.3 Operating and Support Hazard Analysis (O&SHA) – The Contractor shall document O&SHA to evaluate activities for hazards introduced during pre-launch processing and to evaluate the adequacy of operational and support procedures used to eliminate, control, or mitigate hazards (DID MA 3-6).

3.2.2.4 Software Safety Analysis – The Contractor shall perform Software Safety Analyses to demonstrate that adequate inhibits and controls are incorporated to eliminate or mitigate hazards associated with software.

3.2.3 Missile System Pre-Launch Safety Package (MSPSP) – The Contractor shall prepare an integrated MSPSP (DID MA 3-7).

3.2.4 Verification Tracking Log

The Contractor shall prepare, implement, and maintain a Verification Tracking Log (VTL) (DID MA 3-8).

3.2.5 Safety Waivers

The Contractor shall submit Safety Waivers or Deviations for variations to the applicable safety requirements (DID MA 3-9).

3.2.6 Orbital Debris Assessment

The Contractor shall prepare an Orbital Debris Assessment (ODA) (DID MA 3-10).

3.2.7 Mishap Reporting and Investigation

The Contractor shall prepare a contingency plan (DID MA 3-11). The Contractor shall report mishaps, incidents, and close calls per NPR 8621.1, NASA Procedures and Guidelines for Mishap Reporting, Investigating, and Recordkeeping.

3.2.8 Range Safety Forms

The Contractor shall prepare the following, as required, by their spacecraft design and/or the Project Office:

a. Kennedy Space Center (KSC) Form Kennedy Technical Instruction (KTI) 5212, Material Selection List for Plastic Films, Foams, and Adhesive Tapes (DID MA 3-12);
b. KSC Form 16-450 NS, Radiation Training & Experience Summary (Non-Ionizing Radiation) (DID MA 3-13);
c. KSC Form 16-294 NS, Radiation Training & Experience Summary (Ionizing Radiation) (DID MA 3-13);
d. KSC Form 16-447, Laser Device Use Request/Authorization (DID MA 3-13);
e. KSC Form 16-451 NS, Radiofrequency/Microwave System Use Request/Authorization (DID MA 3-13);
f. KSC Form 16-295 NS, Radiation Use Request/Authorization (Radioactive Materials) (DID MA 3-13);
g. KSC Form 26-551 V2, Process Waste Questionnaire (DID MA 3-14); and
h. Air Force (AF) Form 813, Request for Environmental Impact Impact Analysis (DID MA 3-15).

Section 4. PROBABILITY RISK ANALYSIS AND RELIABILITY

4.1 Probabilistic Risk Assessment (PRA) and Reliability Program Plan

The Contractor shall prepare and implement a PRA and Reliability Program Plan using both qualitative and quantitative techniques to support decisions regarding safety throughout system development. The Contractor shall present the implementation of these plans and related activities at milestone reviews beginning with the System Requirements Review (DID MA 4-1).

4.2 PRA

The Contractor shall perform a simplified scope PRA on safety critical items per NPR 8705.5, Probabilistic Risk Assessment (PRA) Procedures for NASA Programs and Projects, and NPR 8715.3, NASA General Safety Program Requirements, (DID MA 4-2).

4.3 Failure Modes and Effects Analysis (FMEA) and Critical Items List (CIL)

The Contractor shall perform a FMEA and prepare and maintain a CIL for severity categories 1, 1R, and 1S per Table 4.1 (DID MA 4-3). The Contractor shall analyze single point failure modes resulting in severity categories 1, 1R, and 1S to determine the root cause, corresponding mitigation actions, and retention rationale. The Contractor shall address flight hardware and software that is designed, built, or provided by its organization or subcontractors, from project initiation through launch and mission operations. The Contractor shall address the ground system that interfaces with flight equipment to the extent necessary to assure the integrity and

safety of flight items. The Contractor shall identify and address safety critical software, as defined in NASA-STD-8719.13, Software Safety Standard.

Table 4.1 Severity Categories

Category	Severity	Description
1	Catastrophic/ Critical	Catastrophic failure modes are those that may cause death or a permanent disabling injury or the destruction of a major system or facility on the ground or of the vehicle during the mission. Critical failure modes those that may cause a severe injury or occupational illness to personnel or major property damage to facilities, systems, or flight hardware.
1R	**Chapter 1.**	Failure modes of identical or equivalent redundant hardware or software elements that could result in Category 1 effects if all failed.
1S	**Chapter 2.**	Failure in a safety or hazard monitoring system that could cause the system to fail to detect a hazardous condition or fail to operate during such condition and lead to Category 1 consequences.

4.4 Fault Tree Analysis

The Contractor shall perform quantitative fault tree analyses to address safety critical functions only as part of the PRA (DID MA 4-4). The Contractor shall identify and address safety critical software as defined in NASA-STD-8719.13.

4.5 Reserved

4.6 Reserved

4.7 Reserved

4.8 Reserved

4.9 Trend Analysis

The Contractor shall prepare and maintain a list of subsystem and components to be assessed and parameters to be monitored as defined in the approved PRA and Reliability Program Plan for safety critical functions only.

4.10 Analysis of Test Results

The Contractor shall document the analysis of test information, trend data, and failure investigations with respect to reliability and report the results as defined in the approved PRA and Reliability Program Plan for safety critical functions only.

4.11 Limited Life Items

The Contractor shall prepare and implement a plan to identify and manage limited life items for safety critical functions only (DID MA 4-5).

Section 5. SOFTWARE ASSURANCE (FLIGHT AND GROUND SEGMENTS)

5.1 Applicable Requirements

The Contractor shall comply with the following for software and firmware, hereafter collectively referred to as software:

a. NPR 7150.2, NASA Software Engineering Requirements;
b. NASA-STD-8719.13, Software Safety Standard; and
c. NASA-STD-8739.8, NASA Standard for Software Assurance.

5.2 Software Quality Assurance

The Contractor shall prepare and implement a Software Quality Assurance Plan (SQAP) for software, including Government off-the-shelf (GOTS) software, modified off-the-shelf (MOTS) software, and commercial off-the-shelf (COTS) software (DID MA 5-1). The Contractor shall identify the person responsible for directing and managing the software quality assurance program.

5.3 Verification and Validation

The Contractor shall prepare and implement a Verification and Validation (V&V) program plan to ensure that the software satisfies functional and performance requirements (DID MA 5-2).

5.4 Reviews

The Contractor shall conduct and document periodic reviews, audits, and assessments of the software development process and products. In addition to the reviews specified in Section 8, the Contractor shall provide advance notification to the project office of the following software reviews:

a. Test Readiness Review;
b. Acceptance Review; and
c. Software Safety Program Reviews or system level safety reviews.

5.5 Software Configuration Management

The Contractor shall prepare and implement a Software Configuration Management (SCM) plan (DID MA 5-3).

5.6 Government Furnished Equipment (GFE), Existing, and Purchased Software

The Contractor shall ensure that software provided as GFE, existing, and purchased meets the functional, performance, and interface requirements. The Contractor shall ensure that the software meets applicable standards, including those for design, code, and documentation.

5.7 Version Description Documents (VDD)

The Contractor shall prepare VDDs that identify and document the version of the computer software configuration items (CSCIs) and other deliverable items that comprise the software build or release, including changes since the last VDD was issued (DID MA 5-4).

5.8 Surveillance of Software Development

The Contractor shall provide the following:

a.Access to the software problem reporting system, either through remote means or paper copies;
b.Access to the software documentation (management plans, assurance plans, configuration management plans, design plans);
c.Access to the software review results;
d.Access to the corrective actions from process and product audits;
e.Notification of engineering peer reviews (e.g., code reviews);
f.Access to review action item status and resolution; and
g.Software status report (DID MA 5-5).

Section 6. GROUND SYSTEMS AND EQUIPMENT

6.1 General

The Contractor shall document and implement a ground support equipment program for flight and ground operations products to assure the function and integrity of flight items
(DID MA 6-1).

6.2 Reserved

Section 7. RISK MANAGEMENT

7.1 General

The Contractor shall document and implement a risk management plan (DID MA 7-1).

7.2 Risk List

The Contractor shall prepare and maintain a risk list (DID MA 7-2).

Section 8. SYSTEMS REVIEWS

8.1 Systems Reviews

The Contractor shall participate in the implementation of the Integrated Independent Review Program as required by GSFC-STD-1001, Criteria for Flight Project Critical Milestone Reviews.

The Contractor shall provide a review agenda, presentation materials, and a copy of reference materials at the reviews (DID MA 8-1).

The Contractor shall submit responses to review action items (DID MA 8-2).

8.2 Peer Reviews

The Contractor shall prepare and implement an engineering peer review program that covers the design, development, and testing of hardware and software (DID MA 8-3).

Section 9. SYSTEM PERFORMANCE VERIFICATION

9.1 System Performance Verification Program Plan

The Contractor shall plan and implement a system performance verification program per the requirements of GSFC-STD-7000, General Environmental Verification Standard for GSFC Flight Programs and Projects, (DID MA 9-1).

9.2 Environmental Verification Plan

The Contractor shall prepare and implement an environmental verification plan (DID MA 9-2).

9.3 System Performance Verification Matrix

The Contractor shall prepare and maintain a system performance verification matrix (DID MA 9-3).

9.4 Environmental Test Matrix

The Contractor shall prepare and maintain an environmental test matrix (DID MA 9-4).

9.5 Verification Reports

The Contractor shall prepare and submit verification reports (DID MA 9-5).

9.6 System Performance Verification Report

The Contractor shall prepare and submit system performance reports (DID MA 9-6).

Section 10. WORKMANSHIP

10.1 General

The Contractor shall implement a workmanship program to assure that electronic packaging technologies, processes, and workmanship meet mission objectives for quality and reliability per the requirements of the following standards:

a. NASA-STD-8739.1, Workmanship Standard for Staking and Conformal Coating of Printed Wiring Boards and Electronic Assemblies
b. NASA-STD-8739.2, Workmanship Standard for Surface Mount Technology
c. NASA-STD-8739.3, Soldered Electrical Connections
d. NASA-STD-8739.4, Crimping, Interconnecting Cables, Harnesses, and Wiring
e. NASA-STD-8739.5, Fiber Optic Terminations, Cable Assemblies, and Installation
f. IPC-2221, Generic Standard on Printed Board Design
g. IPC-2222, Sectional Design Standard for Rigid Organic Printed Boards
h. IPC-2223, Sectional Design Standard for Flexible Printed Boards
i. IPC-2225, Sectional Design Standard for Organic Multichip Modules (MCM-L) and MCM-L Assemblies
j. IPC A-600, Acceptability of Printed Boards (Class 3 Requirements)
k. IPC-6011, Generic Performance Specification for Printed Boards (Class 3 Requirements)
l. IPC-6012, Qualification and Performance Specification for Rigid Printed Boards (Class 3/A Requirements)
m. IPC-6013, Qualification and Performance Specification for Flexible Printed Boards (Class 3 Requirements)

n. IPC-6015, Qualification and Performance Specification for Organic Multichip Module (MCM-L) Mounting and Interconnecting Structures
o. IPC-6018, Microwave End Product Board Inspection and Test
p. ANSI/Electrostatic Discharge Association (ESD) S20.20, For the Development of an Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices)

10.2 Design and Process Qualification

The Contractor shall qualify designs and processes that are not covered by the above standards.

10.3 Electrostatic Discharge Control (ESD)

The Contractor shall prepare and implement an ESD control program that conforms to the requirements of ANSI/ESD S20.20 (DID MA 10-1).

Section 11. ELECTRICAL, ELECTRONIC, AND ELECTROMECHANICAL (EEE) PARTS

11.1 General

The Contractor shall plan and implement a parts control program (PCP) plan per the Level 3 requirements of GSFC EEE-INST-002, Instructions for EEE Parts Selection, Screening, Qualification, and Derating (DID MA 11-1).

11.2 Parts Control Board

The Contractor shall establish a parts control board (PCB) that is responsible for the planning, management, and coordination of the selection, application, and procurement requirements of EEE parts (DID 11-2). The PCB membership shall include the Government Project Parts Engineer (PPE) as a voting member. The Government PPE (or a designated alternate) shall be present at all PCB meetings.

11.3 EEE Parts Lists

The Contractor shall develop and maintain EEE parts lists.

11.3.1 Project Approved Parts List (PAPL)

The Contractor shall prepare a list of EEE parts that are approved for use in flight hardware by the PCB (DID MA 11-3).

11.3.2 As-designed Parts List (ADPL)

The Contractor shall prepare a list of EEE parts that are used in the design of flight hardware (DID MA 11-4).

11.3.3 As-built Parts List (ABPL)

The Contractor shall prepare a list of EEE parts that are used in the flight hardware (DID MA 11-5).

Section 12. MATERIALS AND PROCESSES

12.1 General

The Contractor shall prepare and implement a materials and processes selection, implementation, and control plan per the requirements of NASA-STD-6016, Standard Materials and Processes Requirement for Spacecraft (DID MA 12-1).

12.2 Life Test Plan for Lubricated Mechanisms

The Contractor shall prepare and implement a life test plan for lubricated mechanisms (DID MA 12-2).

12.3 Materials Usage Agreement (MUA)

The Contractor shall prepare materials usage agreements (DID MA 12-3).

12.4 Materials Identification and Usage List (MIUL)

The Contractor shall prepare a materials identification and usage list (DID MA 12-4). The Materials and Processes Control Board (MPCB) membership shall include the Government Project's Materials and Processes Engineer (MPE) as a voting member. The Government MPE (or a designated alternate) shall be present at all MPCB meetings.

12.5 Nondestructive Evaluation (NDE) Plan

The Contractor shall prepare and implement a nondestructive evaluation plan for the procedures and specifications used in the inspection of materials (DID MA 12-5).

12.6 Printed Wiring Board (PWB) Test Coupons

The Contractor shall provide PWB test coupons to the GSFC or to a GSFC approved facility for analysis (DID MA 12-6). The Contractor shall not use printed wiring boards until the analyses results are received.

12.7 Lead-free and Tin Whisker Control Plan

The Contractor shall meet the requirements of Government Electronics Information Technology Association (GEIA)-STD-0005-1, Performance Standard for Aerospace and High Performance Electronics Systems Containing Lead-free Solder, and GEIA-STD-0005-2, Standard for Mitigating the Effects of Tin Whiskers in Aerospace and High Performance Electronic Systems, for solders and surface finishes that are less than three percent (3%) lead by weight.

Section 13. CONTAMINATION CONTROL

13.1 Contamination Control Plan

The Contractor shall prepare and implement a contamination control program (DID MA 13-1).

Section 14.METROLOGY AND CALIBRATION

14.1 Metrology and Calibration Program

The Contractor shall plan and implement a documented metrology and calibration program. The Contractor shall comply with ANSI/NCSL Z540.1-1994, Calibration Laboratories and Measuring and Test Equipment – General Requirements.

14.2 Use of Non-calibrated Instruments

The Contractor shall limit the use of non-calibrated instruments to applications where substantiated accuracy is not required and for indication-only purposes in non-hazardous, non-critical applications.

Section 15. GOVERNMENT-INDUSTRY DATA EXCHANGE PROGRAM (GIDEP) ALERTS AND PROBLEM ADVISORIES

15.1 GIDEP

The Contractor shall participate in GIDEP per the GIDEP Operations Manual, S0300-BT-PRO-010, and, GIDEP Requirements Guide, S0300-BU-GYD-010.

15.2 Reviews

The Contractor shall review the following, hereafter referred to collectively as Alerts, for affects on NASA products: GIDEP Alerts; GIDEP SAFE-ALERTS; GIDEP Problem Advisories; GIDEP Agency Action Notices; NASA Advisories and component issues as distributed by the project office.

15.3 Actions

The Contractor shall take action to eliminate or mitigate the effects of Alerts on NASA products.

15.4 Reporting

The Contractor shall report the results of Alert reviews and actions taken (DID MA 15-1).

The Contractor shall prepare and submit failure experience data reports per the requirements of S0300-BT-PRO-010 and S0300-BU-GYD-010 whenever failed or nonconforming items that are available to other buyers are discovered.

The Contractor shall report significant EEE parts, materials, and safety problems
(DID MA 15-2).

The Contractor shall report the status of NASA products that are affected by Alerts or by significant EEE parts, materials, and safety problems at program milestone reviews and readiness reviews. (See Section 8) The Contractor shall include a summary of the review status for EEE parts and materials lists and of actions taken to eliminate or mitigate negative effects.

Section 16. END ITEM ACCEPTANCE DATA PACKAGE

16.1 General

The Contractor shall prepare, maintain, and submit an end item acceptance data package
(DID MA 16-1).

APPENDIX A:

Acronyms

ABPL – As-built Parts List
ADPL – As-designed Parts List
AETD - Applied Engineering and Technology Directorate
AF – Air Force
AFSPCMAN – Air Force Space Command Manual
ANSI – American National Standards Institute
ARB - Anomaly Review Board
ASQ – American Society for Quality
CAGE - Commercial and Government Entity
CDR – Critical Design Review
CDRL – Contract Data Requirements List
CIL – Critical Items List
COTS – Commercial Off-the-Shelf
CR – Change Request
CR – Contractor Report
CSCI – Computer Software Configuration Item
DID – Data Item Description
DO - Delivery Order
DR – Discrepancy Report
EEE – Electrical, Electronic, and Electromechanical
ESD – Electrostatic Discharge Control
FAP – Flight Assurance Procedure
FAR – Federal Acquisition Regulations
FMEA – Failure Modes and Effects Analysis
FOR – Flight Operations Review
FSC - Federal Supplier Code
FTA – Fault Tree Analysis
GEIA - Government Electronics Information Technology Association
GFE – Government Furnished Equipment
GIDEP – Government-Industry Data Exchange Program
GOTS – Government Off-the-Shelf
GSE – Ground Support Equipment
GSFC – Goddard Space Flight Center

I&T – Integration and Test
IC – Integrated Circuit
IEEE – Institute of Electrical and Electronics Engineers
IPC - Originally “Institute for Interconnecting and Packaging Electronic Circuits,” now “IPC”
=
ISO – International Organization for Standardization
KNPR – Kennedy NASA Procedural Requirements
KSC – Kennedy Space Center
KTI – Kennedy Technical Instruction
M&P – Materials and Processes
MA – Mission Assurance
MAIP – Mission Assurance Implementation Plan
MAPTIS – Materials and Processes Technical Information System
MAR – Mission Assurance Requirements
MCM-L – Multichip Modules
MIUL – Materials Identification and Usage List
MOR – Mission Operations Review
MOTS – Modified Off-the-Shelf
MPCB – Materials and Processes Control Board
MPE – Materials and Processes Engineer
MRB – Material Review Board
MSPSP – Missile System Pre-Launch Safety Package
MUA – Materials Usage Agreement
NASA – National Aeronautics and Space Administration
NCSL – Originally “National Conference of Standards Laboratories,” now “NCSL”
NDE – Nondestructive Evaluation
NPD – NASA Policy Directive
NPR – NASA Procedural Requirement
NSS – NASA Safety Standard
O&SHA – Operating and Support Hazard Analyses
ODA – Orbital Debris Assessment
OHA – Operations Hazard Analysis
OSHA – Occupational Safety and Health Administration

PAPL – Project Approved Parts List
PCB – Parts Control Board
PCP – Parts Control Program
PDR – Preliminary Design Review
PER – Pre-Environmental Review
PHA – Preliminary Hazard Analyses
=
PPE – Project Parts Engineer
PRA – Probabilistic Risk Assessment
PSR – Pre-Ship Review
PWB – Printed Wiring Board
RSA - Rapid III Spacecraft Acquisition
S&MA – Safety and Mission Assurance
SAE – Society of Automotive Engineers
SCM – Software Configuration Management
SQAP – Software Quality Assurance Plan
SRR – Systems Requirements Review
SSPP – System Safety Program Plan
STD - Standard
STS – Space Transportation System
TIM – Technical Interchange Meeting
TM – Technical Memorandum
V&V – Verification and Validation
VDD – Version Description Documents
VTL – Verification Tracking Log

APPENDIX B

Glossary of Terms

The following definitions apply within the context of this document:

Acceptance Tests: The validation process that demonstrates that hardware is acceptable for flight. It also serves as a quality control screen to detect deficiencies and, normally, to provide the basis for delivery of an item under terms of a contract.

Anomaly: An anomaly is an unexpected event, hardware or software damage, a departure from established procedures or performance or a deviation of hardware or software performance outside certified design/performance specification limits. Anomalies include sense of problem and failure. This includes unexpected power glitches, single event upsets, unexpected degradation and autonomous resets.

Assembly: A functional subdivision of a component consisting of parts or subassemblies that perform functions necessary for the operation of the component as a whole. Examples are a power amplifier and gyroscope. (See Level of Assembly)

Audit: A review of the Contractor's (or sub-contractor's) documentation or hardware to verify that it complies with project requirements.

Collected Volatile Condensable Material (CVCM): The quantity of outgassed matter from a test specimen that condenses on a collector maintained at a specific constant temperature for a specified time.

Component: See Level of Assembly.

Configuration: The functional and physical characteristics of the payload and all its integral parts, assemblies, and systems capable of fulfilling the fit, form and functional requirements defined by performance specifications and engineering drawings.

Configuration Control: The systematic evaluation, coordination, and formal approval/disapproval of proposed changes, including the implementation of all approved changes to the design and production of an item with a configuration formally approved by the Contractor/purchaser/both.

Configuration Management (CM): The systematic control and evaluation of all changes to baseline documentation and subsequent changes to that documentation which define the original scope of effort to be accomplished (contract and reference documentation) and the systematic control, identification, status accounting and verification of all configuration items.

Contamination: The presence of materials of molecular or particulate nature, which degrade the performance of hardware.

Derating: The reduction of the applied load (or rating) of a device to improve reliability or to permit operation at high ambient temperatures.

Design Specification: Generic designation for a specification that describes functional and physical requirements for an article, usually at the component level or higher levels of assembly. In its initial form, the design specification is a statement of functional requirements with only general coverage of physical and test requirements.

The design specification evolves through the project life cycle to reflect progressive refinements in performance, design, configuration, and test requirements. In many projects, the end-item specifications serve all the purposes of design specifications for the contract end-items. Design specifications provide the basis for technical and engineering management control.

Designated Representative: An individual (such as a NASA plant representative), firm (such as assessment contractor), Department of Defense (DoD) plant representative, or other Government representative designated and authorized by NASA to perform a specific function for NASA. As related to the contractor's effort, this may include evaluation, assessment, design review, participation, and review/approval of certain documents or actions.

Destructive Physical Analysis (DPA): An internal destructive examination of a finished part or device to assess design, workmanship, assembly, and any other processing associated with fabrication of the part.

Design Qualification Tests: Tests intended to demonstrate that an item will function within performance specifications under simulated conditions more severe than those expected from ground handling, launch, and orbital operations. Their purpose is to uncover deficiencies in design and method of manufacture. They are not intended to exceed design safety margins or to introduce unrealistic modes of failure. The design qualification tests may be to either "prototype" or "protoflight" test levels.

Discrepancy: See Nonconformance.

Electromagnetic Compatibility (EMC): The condition that prevails when various electronic devices are performing their functions according to design in a common electromagnetic environment.

Electromagnetic Interference (EMI): Electromagnetic energy, which interrupts, obstructs, or otherwise degrades or limits the effective performance of electrical equipment.

Electromagnetic Susceptibility: Undesired response by a component, subsystem, or system to conducted or radiated electromagnetic emissions.

End-to-End Tests: Tests performed on the integrated ground and flight system, including all elements of the payload, its control, stimulation, communications, and data processing to demonstrate that the entire system is operating in a manner to fulfill all mission requirements and objectives.

Fail-safe: (See Fracture Control Program)

Failure: A departure from specification that is discovered in the functioning or operation of the hardware or software. See nonconformance.

Failure Modes and Effects Analysis (FMEA): A procedure by which each credible failure mode of each item from a low indenture level to the highest is analyzed to determine the effects on the system and to classify each potential failure mode in accordance with the severity of its effect.

Flight Acceptance: See Acceptance Tests.

Fracture Control Program: A systematic project activity to ensure that a payload intended for flight has sufficient structural integrity as to present no critical or catastrophic hazard. Also, to ensure quality of performance in the structural area for any payload/spacecraft project. Central to the program is fracture control analysis, which includes the concepts of fail-safe and safe-life, defined as follows:

Fail-safe: Ensures that a structural element, because of structural redundancy, will not cause collapse of the remaining structure or have any detrimental effects on mission performance. (See Fracture Control Program)

Safe-life: Ensures that the largest flaw that could remain undetected after non-destructive examination would not grow to failure during the mission. (See Fracture Control Program)

Functional Tests: The operation of a unit in accordance with a defined operational procedure to determine whether performance is within the specified requirements.

Hardware: As used in this document, there are two major categories of hardware as follows:

Prototype Hardware: Hardware of a new design; it is subject to a design qualification test program and is not intended for flight.

Flight Hardware: Hardware to be used operationally in space. It includes the following subsets:

Protoflight Hardware: Flight hardware of a new design, subject to a qualification test program that combines elements of prototype and flight acceptance verification; that is, the application of design qualification test levels and duration of flight acceptance tests.

Follow-On Hardware: Flight hardware built in accordance with a design that has been qualified either as prototype or as protoflight hardware; follow-on hardware is subject to a flight acceptance test program.

Spare Hardware: Hardware whose design has been proven in a design qualification test program, subject to a flight acceptance test program and used to replace flight hardware that is no longer acceptable for flight.

Re-flight Hardware: Flight hardware that has been used operationally in space and is to be reused in the same way; the validation program to which it is subject depends on its past performance, current status, and the upcoming mission.

Inspection: The process of measuring, examining, gauging, or otherwise comparing an article or service with specified requirements.

Instrument: See Level of Assembly.

Level of Assembly: The environmental test requirements of GEVS generally start at the component or unit-level assembly and continue hardware/software build through the system level (referred to in GEVS as the payload or SC level). The assurance program includes the part level. Verification testing may also include testing at the assembly and subassembly levels of assembly; for test recordkeeping these levels are combined into a "subassembly" level. The verification program continues through launch, and on-orbit performance. The following levels of assembly are used for describing test and analysis configurations:

Part: A hardware element that is not normally subject to further subdivision or disassembly without destruction of design use. Examples include resistor, integrated circuit, relay, connector, bolt, and gaskets.

Subassembly: A subdivision of an assembly. Examples are wire harness and loaded printed circuit boards. (Also see Assembly)

Component or unit: A functional subdivision of a subsystem and generally a self-contained combination of items performing a function necessary for the subsystem's operation. Examples are electronic box, transmitter, gyro package, actuator, motor, battery. For the purposes of this document, "component" and "unit" are used interchangeably.

Section: A structurally integrated set of components and integrating hardware that form a subdivision of a subsystem, module, etc. A section forms a testable level of assembly, such as components/units mounted into a structural mounting tray or panel-like assembly, or components that are stacked.

Subsystem: A functional subdivision of a payload consisting of two or more components. Examples are structural, attitude control, electrical power, and communication subsystems. Also included as subsystems of the payload are the science instruments or experiments.

Instrument: A SC subsystem consisting of sensors and associated hardware for making measurements or observations in space. For the purposes of this document, an instrument is considered a subsystem (of the SC).

Module: A major subdivision of the payload that is viewed as a physical and functional entity for the purposes of analysis, manufacturing, testing, and record keeping. Examples include SC bus, science payload and upper stage vehicle.

Payload: An integrated assemblage of modules, subsystems, etc., designed to perform a specified mission in space. For the purposes of this document, "payload" and "spacecraft" are used interchangeably. Other terms used to designate this level of assembly are Laboratory, Observatory, and satellite.

Spacecraft: See Payload. Other terms used to designate this level of assembly are Laboratory, Observatory, and Satellite.

Limit Level: The maximum expected flight value.

Limited Life Items: Spaceflight hardware that (1) has an expected failure-free life that is less than the projected mission life, when considering cumulative ground operation, storage and on-orbit operation, and (2) has limited shelf life material used to fabricate flight hardware.

Maintainability: A measure of the ease and rapidity with which a system or equipment can be restored to operational status following a failure. It is characteristic of equipment design and installation, personnel availability in the required skill levels, adequacy of maintenance procedures and test equipment, and the physical environment under which maintenance is performed.

Margin: The amount by which hardware capability exceeds mission requirements.

Mission Assurance: The integrated use of the tasks of system safety, reliability assurance engineering, maintainability engineering, mission environmental engineering, materials and processes engineering, electronic parts engineering, quality assurance, software assurance, configuration management, and risk management to support NASA projects.

Module: See Level of Assembly.

Monitor: To keep track of the progress of a performance assurance activity; the monitor need not be present at the scene during the entire course of the activity, but will review resulting data or other associated documentation (see Witness).

Nonconformance: A condition of any hardware, software, material, or service in which one or more characteristics do not conform to requirements. As applied in quality assurance, nonconformances fall into two type categories – discrepancies and failures. A discrepancy is a departure from specification that is detected during inspection or process control testing, etc., while the hardware or software is not

functioning or operating. A failure is a departure from specification that is discovered in the functioning or operation of the hardware or software.

Offgassing: The emanation of volatile matter of any kind from materials into a manned pressurized volume.

Outgassing: The emanation of volatile materials under vacuum conditions resulting in a mass loss and/or material condensation on nearby surfaces.

Part: See Level of Assembly.

Payload: See Level of Assembly.

Payload-Instrument: An instrument sensor mounted on and part of a spacecraft. It is the payload of the spacecraft as opposed to the payload of the launch vehicle.

Performance Verification: Determination by test, analysis, or a combination of the two that the payload element can operate as intended in a particular mission; this includes being satisfied that the design of the payload or element has been qualified and that the particular item has been accepted as true to the design and ready for flight operations.

Protoflight Testing, Hardware: See Hardware.

Prototype Testing, Hardware: See Hardware.

Qualification: See Design Qualification Tests.

Red Tag/Green Tag: Physical tags affixed to flight hardware that mean: red (remove before flight) and green (enable before flight).

Redundancy (of design): The use of more than one independent means of accomplishing a given function.

Reliability: The probability that an item will perform its intended function for a specified interval under stated conditions.

Repair: A corrective maintenance action performed as a result of a failure so as to restore an item to operate within specified limits.

Rework: Return for completion of operations (complete to drawing). The article is to be reprocessed to conform to the original specifications or drawings.

Section: See Level of Assembly.

Safe-life: See Fracture Control Program.

Similarity: Verification by: a procedure of comparing an item to a similar one that has been verified. Configuration, test data, application and environment will be evaluated. It will be determined that design differences are insignificant, environmental stress will not be greater in the new application, and that manufacturer and manufacturing methods are the same.

Single Point Failure: The failure of a single hardware element which would result in loss of mission objectives, hardware, or crew, as defined for the specific application or project for which a single point failure analysis is performed.

Spacecraft: See Level of Assembly.

Subassembly: See Level of Assembly.

Subsystem: See Level of Assembly.

Temperature Cycle: A transition from some initial temperature condition to temperature stabilization at one extreme and then to temperature stabilization at the opposite extreme, then returning to the initial temperature condition.

Temperature Stabilization: The condition that exists when the rate of change of temperatures has decreased to the point where the test item may be expected to remain within the specified test tolerance for the necessary duration or where further change is considered acceptable.

Thermal Balance Test: A test conducted to verify the adequacy of the thermal model, the adequacy of the thermal design, and the capability of the thermal control system to maintain thermal conditions within established mission limits.

Thermal-Vacuum Test: A test conducted to demonstrate the capability of the test item to operate satisfactorily in vacuum at temperatures based on those expected for the mission. The test, including the gradient shifts induced by cycling between temperature extremes, can also uncover latent defects in design, parts, and workmanship.

Torque Margin: Torque margin is equal to the torque ratio minus one.

Torque Ratio: Torque ratio is a measure of the degree to which the torque available to accomplish a mechanical function exceeds the torque required.

Total Mass Loss (TML): Total mass of material outgassed from a specimen that is maintained at a specified constant temperature and operating pressure for a specified time.

Unit: See Level of Assembly.

Validation: The process of evaluating software during, or at the end of, the software development process to determine whether it satisfies specified requirements.

Variance: General term for Waiver or Deviation

Verification: The process of evaluating software to determine whether the products of a given development phase (or activity) satisfy the conditions imposed at the start of that phase (or activity).

Vibroacoustics: An environment induced by high-intensity acoustic noise associated with various segments of the flight profile; it manifests itself throughout the payload in the form of directly transmitted acoustic excitation and as structure-borne random vibration.

Witness: A personal, on-the-scene observation of a performance assurance activity with the purpose of verifying compliance with project requirements (see Monitor).

Workmanship Tests: Tests performed during the environmental verification program to verify adequate workmanship in the construction of a test item. It is often necessary to impose stresses beyond those predicted for the mission in order to uncover defects. Thus random vibration

tests are conducted specifically to detect bad solder joints, loose or missing fasteners, improperly mounted parts, etc. Cycling between temperature extremes during thermal-vacuum testing and the presence of electromagnetic interference during EMC testing can also reveal the lack of proper construction and adequate workmanship.

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APPENDIX C

Applicable Documents and Forms Lists

Document Name	Document Number, Revision, & Date	MAR Section(s) and//or DID(s)	Document Sources and/or Notes to User
Facility-specific Safety Requirements	No Information	3.1.1	These documents are mission-specific. Obtain them from the Project Office.
Launch Range Safety Requirements	No Information	3.1	These documents are mission-specific. Obtain them from the Project Office.
NASA Fault Tree Handbook for Aerospace Applications	Version 1.1, August 2002	DID MA 4-4	http://www.hq.nasa.gov/office/codeq/doctree/fthb.pdf
Outgassing Data for Selecting Spacecraft Materials	On-Line, March 25, 2009	DID MA 13-1	http://outgassing.nasa.gov/
PRA Procedures Guide for NASA Managers and Practitioners	Version 1.1, August 2002	DID MA 4-2	http://www.hq.nasa.gov/office/codeq/doctree/praguide.pdf
Project Systems Review Plan	No Information	DIDs MA 8-1 & 8-2	This document is mission-specific. Obtain it from the Project Office.
Range Safety User Requirements Manual	AFSPCMAN 91-710	3.1.1; DIDs MA 3-1 through 3-5, DIDs MA 3-6 through 3-9	http://kscsma.ksc.nasa.gov/ELVPayloadSafety/Requirements.html
For the Development of an Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices)	ANSI/ESD S20.20-2007, March 2007	10.1, 10.3, DID MA 10-1	http://workmanship.nasa.gov/ws_esds2020.jsp http://www.esda.org/keydownloads.html
IEEE Standard for Software Configuration Management Plans	ANSI-IEEE Standard 828-2005, January 2005	DIDs MA 5-3 & 5-5	Purchase at: https://sbwsweb.ieee.org/ecustomercme_enu/start.swe?SWECmd=GotoView&src=0&Join=n&SWEView=Catalog+View+(eSales)_Main_Journal Mags_IEEE&mem_type=Customer&HideNew=N&SWEHo=sbwsweb.ieee.org&SWETS=1244080874
IEEE Guide to Software Configuration Management	ANSI-IEEE Standard 1042-1987	DIDs MA 5-3 &5-5	Purchase at: https://sbwsweb.ieee.org/ecustomercme_enu/start.swe?SWECmd=GotoView&src=0&Join=n&SWEView=Catalog+View+(eSales)_Main_Journal Mags_IEEE&mem_type=Customer&HideNew=N&SWEHo=sbwsweb.ieee.org&SWETS=1244080874

Document Name	Document Number, Revision, & Date	MAR Section(s) and//or DID(s)	Document Sources and/or Notes to User
Quality Management Systems - Requirements	ANSI/ISO/ASQ Q9001, 2008	2.1; DID MA 2-1	Purchase at http://webstore.ansi.org/ or http://www.asq.org/quality-press/index.html . Note: Contractor may use Q9001:2000 or Q9001:2008 version of this document.
Calibration and Measurement and Test Equipment – General Requirements	ANSI/NCSL Z540.1-1994 (R2002), Revised 2002	14.1	Purchase at http://webstore.ansi.org/ or http://store.ncsli.org/Documentary_Standards_C35.cfm . Note: July 2007 this standard was withdrawn as an active standard and superseded by ANSI/ISO/IEC 17025:2005 for part 1 and ANSI/NCSL Z540.3-2007 for part 2. It is, however, still available.
Standard Test Methods for Total Mass Loss and Collected Volatile Condensable Materials from Outgassing in a Vacuum Environment	ASTM E595, December 1, 2007	DID MA 13-1	Purchase at http://www.astm.org/Standards/E595.htm .
Performance Standard for Aerospace and High Performance Electronics Systems Containing Lead-free Solder	GEIA –STD-0005-1, Revision/Edition 06, June 2006	12.7	Purchase at http://webstore.ansi.org/RecordDetail.aspx?sku=GEIA-STD-0005-1 .
Standard for Mitigating the Effects of Tin Whiskers in Aerospace and High Performance Electronic Systems	GEIA-STD-0005-2, Revision/Edition 06, September 4, 2006	12.7	Purchase at http://webstore.ansi.org/RecordDetail.aspx?sku=GEIA-STD-0005-2 .
Applied Engineering and Technology Directorate Safety Manual Safety Manual	GSFC 500-PG-8715.1.2, Initial, February 23, 2006	3.1.2; DIDs MA 3-2, 3-5	http://gdms.gsfc.nasa.gov/gdmsnew/home.jsp or Available at RSDO Website, http://rsdo.gsfc.nasa.gov/ .
Instructions for EEE Parts Selection, Screening, Qualification, and Derating	GSFC EEE-INST-002 with Addendum 1, April 2008	11.1; DID MA 11-1	http://nepp.nasa.gov/index_nasa.cfm/477/FFB52B88-36AE-4378-A05B2C084B5EE2CC/ Available at RSDO Website, http://rsdo.gsfc.nasa.gov/ .
Performing a Failure Mode and Effects Analysis	GSFC FAP P-322-208, DRAFT	DID MA 4-3	Available at RSDO Website, http://rsdo.gsfc.nasa.gov/ .
Engineering Peer Reviews	GPR 8700.6, Revision A, January 26, 2005	DID MA 8-3	Available at RSDO Website, http://rsdo.gsfc.nasa.gov/
Specification for Destructive Physical Analysis	GSFC S-311-M-70	11.1; DID MA 11-1	http://nepp.nasa.gov/index_nasa.cfm/472/9252CCDC-CECD-4DD5-A55D4A7080B4F0F1/ Available at RSDO Website, http://rsdo.gsfc.nasa.gov/ .

Document Name	Document Number, Revision, & Date	MAR Section(s) and//or DID(s)	Document Sources and/or Notes to User
Risk Management Reporting	GSFC-STD-0002, Initial, May 8, 2009	DID MA 7-2	http://standards.gsfc.nasa.gov/gsfc-stds.html
Rules for the Design, Development, Verification, and Operation of Flight Systems	GSFC-STD-1000, Revision D, June 2, 2008	DID MA 6-1, 13-1	http://standards.gsfc.nasa.gov/gsfc-stds.html
Criteria for Flight Project Critical Milestone Reviews	GSFC-STD-1001, Initial, February 19, 2005	8.1; DIDs MA 8-1 & 8-2	http://standards.gsfc.nasa.gov/gsfc-stds.html http://msc-docsrv.gsfc.nasa.gov/cmdata/170/std/GSFC-STD-1001.pdf
General Environmental Verification Standard (GEVS) for GSFC Flight Programs and Projects	GSFC-STD-7000, Revision D, June 2, 2008	9.1; DIDs MA 9-1 through 9-6 & 13-1	http://standards.gsfc.nasa.gov/gsfc-stds.html http://gdms.gsfc.nasa.gov/gdmsnew/home.jsp (under "Technical Rules")
Software Quality Assurance Plans	IEEE Standard 730-2002, September 2002	DID MA 5-1	Purchase at https://sbwsweb.ieee.org/ecustomercme_enu/start.swe?SWECmd=GotoView&src=0&Join=n&SWEView=Catalog+View+(eSales)_Main_Journal Mags_IEEE&mem_type=Customer&HideNew=N&SWEHo=sbwsweb.ieee.org&SWETS=1244080874
Software Verification & Validation	IEEE Standard 1012-2004, January 2005	DID MA 5-2	Purchase at: https://sbwsweb.ieee.org/ecustomercme_enu/start.swe?SWECmd=GotoView&src=0&Join=n&SWEView=Catalog+View+(eSales)_Main_Journal Mags_IEEE&mem_type=Customer&HideNew=N&SWEHo=sbwsweb.ieee.org&SWETS=1244080874
IEEE Guide for Software Verification and Validation Plans	IEEE Standard 1059-1993, January 1993	DID MA 5-2	Purchase at: https://sbwsweb.ieee.org/ecustomercme_enu/start.swe?SWECmd=GotoView&src=0&Join=n&SWEView=Catalog+View+(eSales)_Main_Journal Mags_IEEE&mem_type=Customer&HideNew=N&SWEHo=sbwsweb.ieee.org&SWETS=1244080874
Guidelines for Acceptability of Printed Boards (Class 3 Requirements)	IPC A-600G, Revision G, September 2004	10.1; DID MA 12-6	Purchase at http://portal.ipc.org/Association/Index.htm .
Generic Standard on Printed Board Design	IPC-2221A, Revision A, June 2003	10.1	Purchase at http://portal.ipc.org/Association/Index.htm .
Sectional Design Standard for Rigid Organic Printed Boards	IPC-2222, Initial, February 1999	10.1	Purchase at http://portal.ipc.org/Association/Index.htm .

Document Name	Document Number, Revision, & Date	MAR Section(s) and//or DID(s)	Document Sources and/or Notes to User
Sectional Design Standard for Flexible Printed Boards	IPC-2223A, Revision A, September 2007	10.1	Purchase at http://portal.ipc.org/Association/Index.htm .
Sectional Design Standard for Organic Multichip Modules (MCM-L) and MCM-L Assemblies	IPC-2225, Initial, March 2000	10.1	Purchase at http://portal.ipc.org/Association/Index.htm .
Generic Performance Specification for Printed Boards (Class 3 Requirements)	IPC-6011, Initial, July 1996	10.1; DID MA 12-6	Purchase at http://portal.ipc.org/Association/Index.htm .
Qualification and Performance Specification for Rigid Printed Boards (Class 3/A Requirements)	IPC-6012B, Revision B with Amendment 1, January 2007	10.1; DID MA 12-6	Purchase at http://portal.ipc.org/Association/Index.htm .
Qualification and Performance Specification for Flexible Printed Boards (Class 3 requirements)	IPC-6013B, Revision B, February 2009	10.1; DID MA 12-6	Purchase at http://portal.ipc.org/Association/Index.htm .
Qualification and Performance Specification for Organic Multichip Module (MCM-L) Mounting and Interconnecting Structures	IPC-6015, Initial, February 1998	10.1	Purchase at http://portal.ipc.org/Association/Index.htm .
Microwave End Product Board Inspection and Test	IPC-6018A, Revision A, January 2002	10.1, DID MA 12-6	Purchase at http://portal.ipc.org/Association/Index.htm .
Guidelines for Quality Management System Documentation	ISO/TR 10013:2001 2001	2.1; DID MA 2-1	Purchase at http://webstore.ansi.org/RecordDetail.aspx?sku=ISO%2fTR+10013%3a2001&source=google&adgroup=iso10&keyword=iso%2Ftr%2010013&gclid=COH58eKq7ZoCFQOcFQodsErqAw .
KSC Ionizing Radiation Protection Program	KNPR 1860.1, Revision Basic-1, October 15, 2004	DID MA 3-13	Available at RSDO Website, http://rsdo.gsfc.nasa.gov/ .
Non-Ionizing Radiation Protection Program	KNPR 1860.2, Revision Basic-1, October 15, 2004	DID MA 3-13	Available at RSDO Website, http://rsdo.gsfc.nasa.gov/ .
KSC Safety Practices Procedural Requirements	KNPR 8715.3, Revision G, November 12, 2008	3.1.1; DID MA 3-2, & 3-9	http://kscsma.ksc.nasa.gov/ELVPayloadSafety/Requirements.html

Document Name	Document Number, Revision, & Date	MAR Section(s) and//or DID(s)	Document Sources and/or Notes to User
Standard Practice for System Safety	MIL-STD-882, Revision D, February 10, 2000	DID MA 3-4	http://www.assistdocs.com/search/document_details.cfm?ident_number=36027&StartRow=1&PaginatorPageNumber=1&doc_id=MIL-STD-882&search_method=BASIC
Department of Defense Inspection Program Requirements, Nondestructive for Aircraft and Missile Materials and Parts	MIL-HDBK-6870, Revision A, August 28, 2001	DID MA 12-5	http://www.everyspec.com/MIL-HDBK/MIL-HDBK+(3000+-+8999)/MIL-HDBK-6870A_10214/ Note: This is not a Government/Issuing Organization website so documents are not under configuration management.
Guidelines for the Selection of Metallic Materials for Stress Corrosion Cracking Resistance in Sodium Chloride Environment	MSFC-STD-3029, Revision A, February 24, 2005	DID MA 12-	http://standards.nasa.gov/documents/msfc
Lubrication for Space Applications	NASA CR-2005-213424, Initial, January 2005	DID MA 12-2	http://gltrs.grc.nasa.gov/cgi-bin/GLTRS/browse.pl?2005/CR-2005-213424.html
Nondestructive Evaluation Requirements for Fracture-Critical Metallic Components	NASA-STD-5009, Initial, April 7 2008	DID MA 12-5	http://standards.nasa.gov/documents/detail/3315641
Standard Materials and Processes Requirement for Spacecraft	NASA-STD-6016, Initial, July 2008	12.1; DID MA 12-1 through 12-5	http://standards.nasa.gov/released/NASA/NASA_STD_6016_APPROVED_2008_07_11.pdf
Standard for Lifting Devices and Equipment	NASA-STD-8719.9, Initial, October 1, 2007	3.2.2.2, DIDs MA 3-5, 6-1	http://www.hq.nasa.gov/office/codeq/doctree/87199.htm
Software Safety Standard	NASA-STD-8719.13, Revision B with Change 1, July 8, 2004	4.3, 4.4, 5.1	http://www.hq.nasa.gov/office/codeq/doctree/safeheal.htm
Process for Limiting Orbital Debris	NASA-STD-8719.14, Initial with Change 1, August 28, 2007	DID MA 3-10	http://www.hq.nasa.gov/office/codeq/doctree/safeheal.htm
Planning, Developing and Managing an Effective Reliability and Maintainability (R&M) Program	NASA-STD-8729.1, Initial, December 1998	DID MA 4-1	http://www.hq.nasa.gov/office/codeq/doctree/87291.htm

Document Name	Document Number, Revision, & Date	MAR Section(s) and//or DID(s)	Document Sources and/or Notes to User
Workmanship Standard for Staking and Conformal Coating of Printed Wiring Boards and Electronic Assemblies	NASA-STD-8739.1, Revision A March 2008	10.1	http://workmanship.nasa.gov/ws_8739_1.jsp
Workmanship Standard for Surface Mount Technology	NASA-STD-8739.2, Initial with Change 1, June 2008	10.1	http://workmanship.nasa.gov/ws_8739_2.jsp
Soldered Electrical Connections	NASA-STD-8739.3, Initial with Change 3, June 2008	10.1	http://workmanship.nasa.gov/ws_8739_3.jsp http://www.hq.nasa.gov/office/codeq/doctree/87393.htm
Crimping, Interconnecting Cables, Harnesses, and Wiring	NASA-STD-8739.4, Initial with Change 4, July 2008	10.1	http://workmanship.nasa.gov/ws_8739_4.jsp
Fiber Optic Terminations, Cable Assemblies, and Installation	NASA-STD-8739.5, Initial with Change 1, July 2008	10.1	http://workmanship.nasa.gov/ws_8739_5.jsp http://www.hq.nasa.gov/office/codeq/87395.htm
NASA Standard for Software Assurance	NASA-STD-8739.8, Initial w/Change 1, July 28, 2004	5.1, DID MA 5-1, 5-2	http://www.hq.nasa.gov/office/codeq/doctree/87398.htm http://www.hq.nasa.gov/office/codeq/doctree/87398.pdf
Lubrication Handbook for the Space Industry (Part A: Solid Lubricants, Part B: Liquid Lubricants)	NASA-TM-86556, Initial, December 1985	DID MA 12-2	http://www.everyspec.com/NASA/NASA+(General)/NASA_TM-86556_6268/ Note: This is not a Government/Issuing Organization website so documents are not under configuration management.
Reliability and Maintainability (R&M) Program Policy	NPD 8720.1, Revision C, April 18, 2008	DID MA 4-1	http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPD&c=8720&s=1C
NASA Software Engineering Requirements	NPR 7150.2, Initial, September 27, 2004	5.1; DIDs MA 5-2, 5-3, 5-4, & 5-5	http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPR&c=7150&s=2
Agency Risk Management Procedural Requirements	NPR 8000.4, Revision A, December 16, 2008	DIDs MA 7-1 & 7-2	http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPR&c=8000&s=4A
NASA Procedures and Guidelines for Mishap Reporting, Investigating, and Recordkeeping	NPR 8621.1, Revision B, May 23, 2006	3.2.7; DID MA 3-11	http://nodis3.gsfc.nasa.gov/displayDir.cfm?Internal_ID=N_PR_8621_001B_&page_name=main http://www.hq.nasa.gov/office/codeq/doctree/safeheal.htm

Document Name	Document Number, Revision, & Date	MAR Section(s) and//or DID(s)	Document Sources and/or Notes to User
Risk Classification for NASA Payloads	NPR 8705.4, Initial, June 14, 2004	A.1; DIDs MA 4-1 through 4-4	http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPR&c=8705&s=4
Probabilistic Risk Assessment (PRA) Procedures for NASA Programs and Projects	NPR 8705.5	4.2; DIDs MA 4-1 & 4-2	http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPR&c=8705&s=5
NASA General Safety Program Requirements	NPR 8715.3 Revision C with Change 3, March 12, 2008	3.1, 3.1.1, 4.2; DIDs MA 3-1, 3-4, 3-6, 3-9, 4-1, 4-2& 4-4	http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPR&c=8715&s=3C http://www.hq.nasa.gov/office/codeq/doctree/safeheal.htm
NASA Procedural Requirements for Limiting Orbital Debris	NPR 8715.6A, Revision A, February 19, 2008	DID MA 3-10	http://www.hq.nasa.gov/office/codeq/doctree/safeheal.htm
Expendable Launch Vehicle Payload Safety Program	NPR 8715.7	3.1, 3.1.1; DID MA 3-1	http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPR&c=8715&s=7 http://www.hq.nasa.gov/office/codeq/doctree/safeheal.htm
Safety Standard for Explosives, Propellants, and Pyrotechnics	NSS 1740.12, Initial, August 1993	3.1.1	http://www.hq.nasa.gov/office/codeq/doctree/safeheal.htm
Guidelines and Assessment Procedures for Limiting Orbital Debris	NSS 1740.14, Initial, August 1995	3.1.1	http://www.orbitaldebris.jsc.nasa.gov/mitigate/safetystandard.html http://www.hq.nasa.gov/office/codeq/doctree/safeheal.htm
GIDEP Operations Manual	S0300-BT-PRO-010, November 1994	15.1, 15.4; DIDs MA 15-1 & 15-2	Available at http://www.gidep.org . Note: Various sections/appendices of document were updated between April 1991 and March 2008.
GIDEP Requirements Guide	S0300-BU-GYD-010, April 2008	15.1, 15.4; DIDs MA 15-1 & 15-2	Available at http://www.gidep.org .
Quality Systems - Aerospace-Model for Quality Assurance in Design, Development, Production, Installation and Servicing	SAE AS9100 Revision C, January 2009	2.1; DIDs MA 2-1 through 2-4	Purchase at: http://store.sae.org/

Form Name	Form Number, Revision, and/or Date	MAR Section(s) or DID(s)	Document Sources and/or Notes to User
Material Selection List for Plastic Films, Foams, and Adhesive Tapes	KSC Form KTI-5211, Revision C	3.2.8; DID MA 3-12	http://kscsma.ksc.nasa.gov/ELVPayloadSafety/Requirements.html
Radiation Training & Experience Summary (Non-Ionizing)	KSC Form 16-450 NS, April 1999	3.2.8; DID MA 3-13	http://kscsma.ksc.nasa.gov/ELVPayloadSafety/Forms.html
Radiation Training & Experience Summary (Ionizing)	KSC Form 16-294 NS, July 2000	3.2.8; DID MA 3-13	http://kscsma.ksc.nasa.gov/ELVPayloadSafety/Forms.html
Laser Device Use Request/ Authorization	KSC Form 16-447, August 1991	3.2.8; DID MA 3-13	http://kscsma.ksc.nasa.gov/ELVPayloadSafety/Forms.html
Radiofrequency Microwave System Use Request/ Authorization	KSC Form 16-451 NS, August 1998	3.2.8; DID MA 3-13	http://kscsma.ksc.nasa.gov/ELVPayloadSafety/Forms.html
Radiation Use Request/ Authorization (Radioactive Materials)	KSC Form 16-295 NS, August 1998	3.2.8; DID MA 3-13	http://kscsma.ksc.nasa.gov/ELVPayloadSafety/Forms.html
Process Waste Questionnaire	KSC Form 26-551 V2, August 2006	3.2.8; DID MA 3-14	http://kscsma.ksc.nasa.gov/ELVPayloadSafety/Forms.html
Request for Environmental Impact Analysis	AF Form 814 (EF-V1), August 1993	3.2.8, DID MA 3-15	Available at RSDO Website, http://rsdo.gsfc.nasa.gov/ .
Problem Impact Statement Parts, Materials and Safety	GSFC Form 4-37, August 2008	DID MA 5-1	Available at RSDO Website, http://rsdo.gsfc.nasa.gov/ .
Material Safety Data Sheet	OSHA Form 20 or DD Form 1813, 1986	DID MA 3-7	http://osha.gov/dsg/hazcom/msds-osha174/msdsform.html

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APPENDIX D:

MAR Data Item Description (DID) List

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DID No.	Section	Title	Due	Purpose
MA 1-1	1.1	Mission Assurance Implementation Plan	1. Contract Baseline MAIP with Core Proposal 2. Mission Specific MAIP with DO Proposal.	Approval
MA 1-2	1.7	Previously Developed Product – Compliance with Requirements	Thirty (30) days after identification of previously developed product	Approval
MA 2-1	2.1	Quality Manual	30 days after DO award	Review
MA 2-2	2.2.2	Reporting of MRB Actions	1. Major MRB actions: within five (5) working days of MRB action 2. Minor MRB actions: within five (5) working days of MRB action	1. Review 2. Review
MA 2-3	2.2.2	Request for a Deviation or Waiver	Within five (5) working days of identifying the need for a deviation or waiver	Approval
MA 2-4	2.2.3	Anomaly Report	1. Initial submission to the project office within 24 hours of occurrence 2. Notice of a change in status within 24 hours of occurrence 3. Proposed closure to the project office prior to closure	1. Information 2. Information 3. Review
MA 3-1	3.1	System Safety Program Plan	1. To Project Office 15 days prior to Systems Requirements Review (SRR) 2. To Launch Range within 30 days of delivery to Project Office (following approval by the Project Office)	Approval
MA 3-2	3.1.2	Safety Procedures for Payload I&T	1. Payload I&T Procedures: Seven (7) days before first use 2. Launch Range Hazardous Procedures: Sixty (60) days prior to first use 3. Launch Range Hazardous Procedures: To Range Safety forty-five (45) days prior to first use (following approval by the Project Office)	Approval
MA 3-3	3.2.1	Safety Requirements Compliance Checklist	Thirty (30) days prior to Preliminary Design Review (PDR)	Approval
MA 3-4	3.2.2.1	Preliminary Hazard Analysis	With MSPSP (DID MA 3-7) no later than thirty (30) days after Mission PDR	Approval
MA 3-5	3.2.2.2	Operations Hazard Analysis	Forty-five (45) days prior to Pre-Environmental Review (PER)	Approval
MA 3-6	3.2.2.3	Operating and Support Hazard Analysis	As a part of the MSPSP (DID MA 3-7)	Approval

DID No.	Section	Title	Due	Purpose
MA 3-7	3.2.3	Missile System Prelaunch Safety Package (MSPSP)	1. Preliminary MSPSP: Thirty (30) days after Mission PDR 2. Intermediate MSPSP: Thirty (30) days prior to Mission Critical Design Review (CDR) 3. Final MSPSP: Sixty (60) days prior to Spacecraft/Observatory shipment to Launch Range 4. Final MSPSP: To Range Safety within ten (10) days after approval by the Project Office	Approval
MA 3-8	3.2.4	Verification Tracking Log	1. With the final MSPSP DID (MA 3-7), identifying hazard controls that are not verified as closed 2. Updates: After Pre-Ship Review (PSR), provide weekly until all hazard controls are verified as closed	Review
MA 3-9	3.2.5	Safety Variance	Within thirty (30) days of identifying the need for a variance	Approval
MA 3-10	3.2.6	Orbital Debris Assessment	1. Preliminary Package: Fifteen (15) days prior to mission PDR 2. Final Package: Sixty (60) days prior to mission CDR 3. Updates to the final package within thirty (30) days of identification of design changes that affect the assessment	1. Review 2. Approval 3. Approval
MA 3-11	3.2.7	Mishap Preparedness and Contingency Plan	30 days prior to mission PDR	Review
MA 3-12	3.2.8	Material Selection List for Plastic Films, Foams, and Adhesive Tapes	With the Final MSPSP (DID MA 3-7)	Review
MA 3-13	3.2.8	Radiation Forms and Analyses	With the Final MSPSP (DID MA 3-7)	Review
MA 3-14	3.2.8	Process Waste Questionnaire	With the Final MSPSP (DID MA 3-7)	Review
MA 3-15	3.2.8	Environmental Impact Statement	With the Final MSPSP (DID MA 3-7)	Review
MA 4-1	4.1	Probabilistic Risk assessment (PRA) and Reliability Program Plan and Reports	1. Final plans fifteen (15) days prior to the Systems Requirements Review (SRR) 2. Activity reports at milestone reviews beginning with the Systems Requirements Review	1. Review 2. Review
MA 4-2	4.2	Probabilistic Risk Assessment	1. Interim report thirty (30) days prior to SRR 2. Updated interim report thirty (30) days prior to CDR 3. Updated interim report thirty(30) days prior to Mission Operations Review (MOR) 4. Final report thirty (30) days prior to Flight Operations Review (FOR)	1. Information 2. Review 3. Review 4. Review

DID No.	Section	Title	Due	Purpose
MA 4-3	4.3	Failure Mode and Effects Analysis (FMEA) and Critical Items List (CIL)	1. Preliminary FMEA thirty (30) days before PDR 2. Final FMEA thirty (30) days prior to CDR 3. Updated FMEA and CIL thirty (30) days prior to each subsequent milestone review leading up to Launch	1. Review 2. Review 3. Review
MA 4-4	4.4	Fault Tree Analysis	Quantitative FTA report in support of safety pivotal event analysis as part of each PRA report	Review
MA 4-5	4.11	Limited-Life Items List	1. Thirty (30) days prior to PDR 2. Updates to the Project Office no later than thirty (30) days after changes	Review
MA 5-1	5.2	Software Quality Assurance Plan	1. Preliminary plan: Fifteen (15) days prior to the SRR 2. Baseline plan: Fifteen (15) days prior to PDR 3. Updates: Fifteen (15) days prior to implementation	1. Review 2. Review 3. Review
MA 5-2	5.3	Software Verification and Validation Plan	1. Preliminary plan: Thirty (30) days after DO award 2. Final Baseline plan: fifteen (15) days prior to SRR 3. Updates: Fifteen (15) days prior to implementation	1. Review 2. Review 3. Review
MA 5-3	5.5	Software Configuration Management Plan	1. Preliminary plan: Thirty (30) days after DO award 2. Final Baseline plan: Fifteen (15) days prior to SRR 3. Updates: Fifteen (15) days prior to implementation	1. Review 2. Review 3. Review
MA 5-4	5.7	Software Version Description Document	With each build or release	Information
MA 5-5	5.8	Software Status Report	Monthly beginning sixty (60) days after DO award	Information
MA 6-1	6.2	Ground Systems and Equipment Plan	Thirty (30) days prior to SRR	Review
MA 7-1	7.1	Risk Management Plan	Fifteen (15) days prior to the SRR	Approval
MA 7-2	7.2	Risk List	Fifteen (15) days prior to each milestone review beginning with PDR	Review
MA 8-1	8.1	Systems Review Materials	1. Agenda: Fourteen (14) days prior to commencement of the review 2. Presentation materials: Seven (7) days prior to the review 3. Reference materials: At the review	Information
MA 8-2	8.1	Request For Action (RFA) Responses	30 days after end of review	Approval
MA 8-3	8.2	Peer Review Program Plan	Sixty (60) days after DO award	Review
MA 9-1	9.1	System Performance Verification Plan	1. Preliminary plan: Sixty (60) days after DO award 2. Final plan: Thirty (30) days prior to CDR	1. Review 2. Approval
MA 9-2	9.2	Environmental Verification Plan	1. Preliminary plan: Sixty (60) days after DO award 2. Final plan: Thirty (30) days prior to CDR	1. Review 2. Approval

DID No.	Section	Title	Due	Purpose
MA 9-3	9.3	System Performance Verification Matrix	Updated matrix included in the data packages for the reviews beginning with PDR	Review
MA 9-4	9.4	Environmental Test Matrix	Updated matrix included in the data packages for reviews beginning with PDR	Review
MA 9-5	9.5	Verification Reports	1. Preliminary verification report: Within seventy-two (72) hours of test completion 2. Final verification report: Within thirty (30) days of test completion	Information
MA 9-6	9.6	System Performance Verification Report	1. Updated reports: With the review data package at milestone reviews, beginning with PDR 2. Final report: Within thirty (30) days after completion of on-orbit checkout	Information
MA 10-1	10.3	ESD Control Plan	Fifteen (15) days prior to the SRR	Review
MA 11-1	11.1	Parts Control Program Plan	Fifteen (15) days prior to the SRR	Approval
MA 11-2	11.2	Parts Control Board Operating Procedures	Sixty (60) days after DO award	Review
MA 11-3	11.3.1	Project Approved Parts List (PAPL)	Ten (10) business days prior to the PCB meeting at which they will be presented	Review
MA 11-4	11.3.2	As Designed Parts List (ADPL)	Ten (10) business days prior to the PCB meeting at which they will be presented	Review
MA 11-5	11.3.3	As Built Parts List (ABPL)	1.EEE Parts Information – Ten (10) business days prior to the PCB meeting at which they will be reviewed 2.ABPL: Fifteen (15) work business prior to PSR	1.Review 2.Review
MA 12-1	12.1	Materials & Processes Selection, Implementation, & Control Plan	Fifteen (15) days prior to the SRR	Approval
MA 12-2	12.2	Life Test Plan and Reports for Lubricated Mechanisms	1. Plan: Thirty (30) days prior to PDR 2. Test report: Thirty (30) days after mechanism's acceptance test completion	1. Approval 2. Review
MA 12-3	12.3	Materials Usage Agreement	1. Initial Submission: All MUAs thirty (30) days prior to CDR 2. After Initial Submission: New or revised MUAs within thirty (30) days of identification	1. Approval 2. Approval
MA 12-4	12.4	Materials Identification and Usage List	1. Thirty (30) days prior to PDR 2. Updates: Within thirty (30) days of identification	Review
MA 12-5	12.5	Nondestructive Evaluation Plan	1. Thirty (30) days prior to PDR 2. Updates: Within thirty (30) days after identification	1. Review 2. Review

DID No.	Section	Title	Due	Purpose
MA 12-6	12.6	Printed Wiring Boards Test Coupons and/or Coupon Analysis Reports	1.Coupons & Supporting Manufacturing Information: As soon as practicable (unless sent to a Project Office/Customer-approved laboratory) 2.Coupon Analysis Reports From a Project Office/Customer-Approved Laboratory: Within ten (10) days of receipt from laboratory	Approval
MA 13-1	13.1	Contamination Control Plan and Data	1. Initial Plan: Thirty (30) days before PDR 2. Final Plan: Thirty (30) days before the CDR 3. Final Thermal Vacuum Bakeout Results: Within thirty (30) of completion 4. Contamination Certificate of Compliance: With End Item Acceptance Data Package (DID MA 16-1)	1. Review 2. Approval 3. Review 4. Review
MA 15-1	15.4	GIDEP Alert and NASA Advisory Dispositions	1. Existing Alert Submittal(s): Alert disposition within thirty (30) days of identification of potential use, or use, of a EEE part or material 2. New/Subsequent Alert Submittals: Alert disposition within thirty (30) days of Alert receipt	Review
MA 15-2	15.4	Documentation on Significant Parts, Materials, and Safety Problems	Within thirty (30) days of identification	Review
MA 16-1	16.1	End Item Acceptance Data Package	Thirty (30) days prior to end item delivery	Approval

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APPENDIX E:

MAR Data Item Descriptions (DIDs)

DID MA 1-1: MISSION ASSURANCE IMPLEMENTATION PLAN (10-21-2008)

Title: Mission Assurance Implementation Plan	DID No.: MA 1-1
Reference: MAR Paragraph 1.1	
Use: Documents the Contractor's plan for implementing a system safety and mission assurance program.	
Related Documents: None	
Place/Time/Purpose of Delivery: - Contract Baseline MAIP - Delivered to the Government with Core Proposal for approval. - Mission Specific MAIP – Delivered to the Government with the Delivery Order Proposal for approval.	
Preparation Information: The MAIP shall cover: - All flight hardware and software that is designed, built, or provided by the Contractor and its subcontractors, or furnished by the Government, from project initiation through launch and mission operations. - The ground system equipment that interfaces with flight equipment to the extent necessary to assure the integrity and safety of flight items (includes electrical, mechanical, software, and test facilities). The MAIP shall include a traceability matrix for the mission assurance requirements	

DID MA 1-2: PREVIOUSLY DEVELOPED PRODUCT – COMPLIANCE WITH REQUIREMENTS (04-18-2008)

Title: Previously Developed Product – Compliance with Requirements	DID No.: MA 1-2
Reference: MAR Paragraph 1.7	
Use: Documents the compliance of previously developed product with the requirements of the SOW and the MAIP.	
Related Documents: -Contractor's Mission Assurance Implementation Plan	
Place/Time/Purpose of Delivery: -Delivered to the Project Office thirty (30) days after identification of the previously developed product for approval.	
Preparation Information: The document shall identify the requirements that apply to the previously developed product through a requirements compliance matrix for the product's specific characteristics and its development. The document shall address all areas of noncompliance through a waiver or deviation.	

DID MA 2-1: QUALITY MANUAL (10-21-2008)

Title: Quality Manual	DID No.: MA 2-1
Reference: MAR Paragraph 2.1	
Use: Documents the Contractor's quality management system.	
Related Documents: -SAE AS9100, Quality Systems - Aerospace - Model for Quality Assurance in Design, Development, Production, Installation and Servicing -ANSI/ISO/ASQC Q9001:2000, Quality Management Systems - Requirements -ISO/TR 10013, Guidelines for Quality Management System Documentation	
Place/Time/Purpose of Delivery: -Deliver to the Project Office thirty (30) days after Delivery Order award for review.	
Preparation Information: Prepare a Quality Manual addressing applicable requirements of AS9100 or ANSI/ISO/ASQC 9001; refer to ISO/TR 10013 for guidelines on preparation of a quality manual.	

DID MA 2-2: REPORTING OF MRB ACTIONS (07-11-2008)

Title: Reporting of MRB Actions	DID No.: MA 2-2
Reference: MAR Paragraph 2.2.2	
Use: Report MRB actions to the project office.	
Related Documents: - SAE AS9100, Quality Systems - Aerospace - Model for Quality Assurance in Design, Development, Production, Installation and Servicing	
Place/Time/Purpose of Delivery: - Major MRB actions: Deliver to the Project Office within five (5) working days of MRB action for review. - Minor MRB actions: Deliver to the Project Office within five (5) working days of MRB action for review.	
Preparation Information: The Contractor shall document relevant information on a Contractor MRB form that includes at least the following: - Identification of project, system, or sub-system; - Identification of item (e.g., assembly, sub-assembly, or part, to include serial number or part number as applicable); - Description of affected item; - Definition of major and minor nonconformances; - Identification of next higher assembly; - Description of anomaly, including activities leading up to the anomaly; - Names and contact information of involved individuals; - Status of item; - Contact information for personnel who originated the report; - Date of original submission to the MRB; and - Actions taken after approval.	

DID MA 2-3: REQUEST FOR A DEVIATION OR WAIVER (04-18-2008)

Title: Request for a deviation or waiver	DID No.: MA 2-3
Reference: MAR Paragraph 2.2.2	
Use: Request Project Office approval of a deviation or waiver.	
Related Documents: -SAE AS9100, Quality Systems - Aerospace - Model for Quality Assurance in Design, Development, Production, Installation and Servicing	
Place/Time/Purpose of Delivery: Deliver to the Project Office within five (5) working days of identifying the need for a deviation or waiver for approval.	
Preparation Information: The Contractor shall identify the requirements that apply to the product and provide specific information regarding the noncompliance of the product with the requirements. The Contractor shall identify the effect of the proposed noncompliance on product performance at higher levels of assembly.	

DID MA 2-4: ANOMALY REPORT (02-19-2009)

Title: Anomaly Report	DID No.: MA 2-4
Reference: MAR Paragraph 2.2.3	
Use: Document anomalies, investigative activities, rationale for closure, and corrective and preventive actions.	
Related Documents: -SAE AS9100, Quality Systems - Aerospace - Model for Quality Assurance in Design, Development, Production, Installation and Servicing	
Place/Time/Purpose of Delivery: - Deliver initial submission to the Project Office within 24 hours of occurrence for information. - Deliver notice of a change in status within 24 hours of occurrence to the Project Office for information. - Deliver the proposed closure to the Project Office prior to closure for approval.	
Preparation Information: Document anomalies, changes in status, or proposed closure to identify the following information: - Identification of project, system, or sub-system; - Identification of failed item (e.g., assembly, sub-assembly, or part); - Description of item; - Identification of next higher assembly; - Description of anomaly, including activities leading up to anomaly, if known; - Names and contact information of individuals involved in anomaly; - Date and time of anomaly; - Status of item; - Contact information for personnel who originated the report; - Date of original submission;	

- Anomaly cause;
- Corrective actions implemented;
- Retesting performed and results;
- Other items affected; and
- Risk ratings—mission impact and certainty in corrective actions.

DID MA 3-1: SYSTEM SAFETY PROGRAM PLAN (04-24-2008)

Title: System Safety Program Plan	DID No.: MA 3-1
Reference: MAR Paragraph 3.1	
Use: The System Safety Program Plan (SSPP) describes the tasks and activities of system safety management and engineering required to identify, evaluate, and eliminate or control hazards to the hardware, software, and system design by reducing the associated risk to an acceptable level throughout the system life cycle, including launch range safety requirements.	
Related Documents: -NPR 8715.3, NASA General Safety Program Requirements, Paragraph 2 -NPR 8715.7, Expendable Launch Vehicle Payload Safety Program -AFSPCMAN 91-710, Range Safety User Requirements Manual, Volume 1, Attachment 2	
Place/Time/Purpose of Delivery: -Deliver to the Project Office fifteen (15) days prior to Systems Requirements Review (SRR) for approval. -After receiving Project Office approval, deliver to the Launch Range for approval within thirty (30) days of delivery to Project Office.	

DID MA 3-1: SYSTEM SAFETY PROGRAM PLAN (04-24-2008) (Continued)

Preparation Information:
The Contractor shall prepare a SSPP that describes the development and implementation of a system safety program that complies with the requirements of NPR 8715.3, NPR 8715.7, the launch service provider, and launch range safety. Refer to AFSPCMAN 91-710, Volume 1, Attachment 2. The Contractor shall:

- -Define the roles and responsibilities of personnel.
- -Define the required documentation, applicable documents, and completion schedules for analyses, reviews, and safety packages.
- -Address support for Reviews, Safety Working Group Meetings, and Technical Interchange Meetings (TIMs).
- -Provide for early identification and control of hazards to personnel, facilities, support equipment, and the flight system during product development, including design, fabrication, test, transportation, and ground activities.
- -Address compliance with the launch range safety requirements.
- -Include a safety review process that meets the requirements of NPR 8715.7.
- -Address compliance with industrial safety requirements imposed by NASA and Occupational Safety and Health Administration (OSHA) design and operational needs (e.g., NASA-STD-8719.9, Standard for Lifting Devices and Equipment) and contractually imposed mission unique obligations.

-Address software safety to identify and mitigate safety-critical software products by the following:

- -Identification of software related hazards;
- -Identification of hazard controls that are implemented with software;
- -Identification and tracking of software safety requirements;
- -Verification results and approved waivers and exceptions for software safety requirements; and
- -Verification of safety discrepancy disposition approvals.

DID MA 3-2: SAFETY PROCEDURES FOR PAYLOAD I&T (01-09-2009)

Title: Hazardous Procedures for Payload I&T and Pre-launch Processing	DID No.: MA 3-2
Reference: MAR Paragraph 3.1.2	
Use: Documents hazardous procedures and associated safeguards that the Contractor shall use for integration and test activities and pre-launch activities that comply with the applicable safety requirements of the installation where the activities are performed.	
Related Documents: - GSFC 500-PG-8715.1.2, AETD Safety Manual (for GSFC I&T operations) - AFSPCMAN 91-710, Range Safety User Requirements Manual - KNPR 8715.3, KSC Safety Practices Procedural Requirements	
Place/Time/Purpose of Delivery: - Submit Payload I&T Hazardous Procedures to the Project Office seven (7) days before first use for approval. - Submit Launch Range Hazardous Procedures to the Project Office sixty (60) days prior to first use for approval. After receiving Project Office approval, submit Launch Range Hazardous Procedures to Range Safety forty-five (45) days prior to first use for approval.	

Preparation Information:

Examples of hazardous procedures include, but are not limited to, the following topics:

- Pressurized propellant systems - pressurization (pneumastat and hydrostat), loading and unloading, sampling, leak testing, venting.
- Launch vehicle and payload systems - pressurization, loading and unloading, leak test, erection and lifting with ordnance and/or propellant, application of power with ordnance and/or propellant, safe and arm pin removal, mate and demate operation.
- Hazardous facilities - high pressure systems, propellant flows in ground systems, propellant cart loading, ordnance checkout and installation, X-ray operations, cryogenic operations, fixture proof tests, emergency blackout procedures.
- Ordnance - bore scope, X-ray, continuity test, propellant trimming, installation, electrical connection and disconnection.
- Work involving lasers, high energy RF emissions, radioactive materials, and hazardous materials.

DID MA 3-3: SAFETY REQUIREMENTS COMPLIANCE CHECKLIST (04-18-2008)

Title: Safety Requirements Compliance Checklist	DID No.: MA 3-3
Reference: MAR Paragraph 3.2.1	
Use: The checklist indicates for each requirement whether the proposed design is compliant, non-compliant but meets intent, non-compliant, or if the requirement is not applicable. An indication other than compliant shall include rationale. Note: the Contractor shall submit safety waivers for non-compliant design elements per paragraph 3.2.6 and DID MA 3-11.	
Related Documents: - AFSPCMAN 91-710, Range Safety User Requirements Manual - Reference MAR Section 3.1.1, Mission Related Safety Requirements Documentation	
Place/Time/Purpose of Delivery: - Deliver to the Project Office thirty (30) days prior to the Preliminary Design Review (PDR) for approval.	

Preparation Information:

The Contractor shall prepare a compliance checklist of all design, test, analysis, and data submittal requirements. The following shall be included:

- Criteria and requirement;
- System;
- Indication of compliance, noncompliance, or not applicable;
- Resolution;
- Reference; and
- Copies of all Range Safety approved non-compliances including waivers and equivalent levels of safety certifications.

DID MA 3-4: PRELIMINARY HAZARD ANALYSIS (04-18-2008)

Title: Preliminary Hazard Analysis	DID No.: MA 3-4
Reference: MAR Paragraph 3.2.2.1	
Use: The Preliminary Hazard Analysis (PHA) is used to obtain an initial risk assessment and identify safety critical areas of a concept or system. It is based on the best available data, including mishap data from similar systems and other lessons learned. The Contractor shall evaluate hazards associated with the proposed design or function for severity, probability, and operational constraints. The Contractor shall identify safety provisions and alternatives that are needed to eliminate hazards or reduce their associated risk to an acceptable level.	
Related Documents: - AFSPCMAN 91-710, Range Safety User Requirements Manual - NPR 8715.3, NASA General Safety Program Requirements - MIL-STD-882, Standard Practice for System Safety	
Place/Time/Purpose of Delivery: - Submit the PHA with the MSPSP to the Project Office no later than thirty (30) days after Mission PDR for approval.	
Preparation Information: The Contractor shall perform and document a PHA to identify safety critical areas, to provide an initial assessment of hazards, and to identify requisite hazard controls and follow-on actions. The results of the PHA shall be used to provide guidance for the tailoring of AFSPCMAN 91-710. Based on the best available data, including mishap data from similar systems and other lessons learned, hazards associated with the proposed design or function shall be evaluated for hazard severity, hazard probability, and operational constraint. Safety studies identifying provisions and alternatives needed to eliminate hazards or reduce their associated risk to an acceptable level shall be included. At a minimum, the PHA shall consider the following for identification and evaluation of hazards: •Hazardous components such as fuels, propellants, lasers, explosives, toxic substances,	

hazardous construction materials, pressure systems, and other energy sources.

- Safety related interface considerations among various elements of the system such as material compatibility, electromagnetic interference, inadvertent activation, fire and explosive initiation and propagation, and hardware and software controls. This shall include consideration of the potential contribution by software, including software developed by other contractors and sources, to subsystem and system mishaps.
- Safety design criteria to control safety-critical software commands and responses such as inadvertent command, failure to command, untimely command or responses, inappropriate magnitude, or designated undesired events shall be identified and appropriate action taken to incorporate them in the software and related hardware specifications.
- Environmental constraints including the operating environments such as drop, shock, vibration, extreme temperatures, humidity, noise, exposure to toxic substances, health hazards, fire, electrostatic discharge, lightning, electromagnetic environmental effects, ionizing and non-ionizing radiation including laser radiation.

DID MA 3-4: PRELIMINARY HAZARD ANALYSIS (04-18-2008) (Continued)

- Operating, test, maintenance, built-in-tests, diagnostics, and emergency procedures (human factors engineering, human error analysis of operator functions, tasks, and requirements; effect of factors such as equipment layout, lighting requirements, potential exposures to toxic materials, effects of noise or radiation on human performance; explosive ordnance render safe and emergency disposal procedures; life support requirements and their safety implications in manned systems, crash safety, egress, rescue, survival, and salvage).
- Those test unique hazards that will be a direct result of the test and evaluation of the article or vehicle.
- Facilities, real property installed equipment, support equipment such as provisions for storage, assembly, checkout, proof testing of hazardous systems and assemblies that may involve toxic, flammable, explosive, corrosive, or cryogenic materials and wastes; radiation or noise emitters; and electrical power sources.
- Training and certification pertaining to hazardous and safety critical operations and

maintenance of hazardous and safety critical systems.

- Safety related equipment, safeguards, and possible alternate approaches such as interlocks; system redundancy; fail-safe design considerations using hardware or software controls; subsystem protection; fire detection and suppression systems; personal protective equipment; heating, ventilation, and air-conditioning; and noise or radiation barriers.
- Malfunctions to the system, subsystems, or software. Each malfunction shall be specified, the cause and resulting sequence of events determined, and the degree of hazard.

DID MA 3-5: OPERATIONS HAZARD ANALYSIS (04-18-2008)

Title: Operations Hazard Analysis	DID No.: MA 3-5
Reference: MAR Paragraph 3.2.2.2	
Use: The operations hazard analysis (OHA) shall demonstrate that hazards related to the operation of hardware and test equipment during integration and test activities have been addressed with respect to facility safety requirements.	
Related Documents: -GSFC 500-PG-8715.1.2, AETD Safety Manual (for operations at GSFC) -NASA-STD-8719.9, Standard for Lifting Devices and Equipment	
Place/Time/Purpose of Delivery: - Deliver the OHA and Hazard Tracking Log to the Project Office forty-five (45) days prior to Per-Environmental Review (PER) for approval.	
Preparation Information: The OHA shall include the following information: - Introduction – a summary of the major findings of the analysis and the proposed corrective actions and definitions of special terms, acronyms, and abbreviations. - System Description – a description of system hardware and configuration, with a list of subsystem components and schedules for integration and testing. - Analysis of Hazards. - List of real or potential hazards to personnel, equipment, and property during I&T processing. - The following information shall be included for each hazard: -System Component/Phase – the phase and component with which the analysis is concerned; e.g., system, subsystem, component, operating/maintenance procedure, or environmental condition. -System Description and Hazard Identification, Indication: -A description of expected results from operating the component/subsystem or	

performing the operating/maintenance action.
  - A complete description of the actual or potential hazard resulting from normal actions or equipment failures; indicate whether the hazard shall cause personnel injury and equipment damage.
  - A description of indications which include means of identifying the hazard to operating or maintenance personnel.
  - A description of the safety hazards of software controlling hardware systems where the hardware effects are safety critical.
- Effect on System – the detrimental effects of an uncontrolled hazard on the system
- Risk Assessment.
- Caution and Warning Notes – a list of warnings, cautions, procedures required in test plans, test procedures, and/or work orders.
- Status/Remarks – the status of actions to implement hazard controls. These actions shall be verified as closed before the associated procedure or test can commence.

- References (e.g., test reports, preliminary operating and maintenance manuals, and other hazard analyses).

DID MA 3-6: OPERATING AND SUPPORT HAZARD ANALYSIS (04-18-2008)

Title: Operating and Support Hazard Analysis (O&SHA)	DID No.: MA 3-6
Reference: MAR Paragraph 3.2.2.3	
Use: The Operating & Support Hazard Analysis (O&SHA) addresses the implementation of safety requirements for personnel, procedures, and equipment used during testing, transportation, storage, and integration operations at the launch site.	
Related Documents: - AFSPCMAN 91-710, Range Safety User Requirements Manual - NPR 8715.3, NASA General Safety Program Requirements	
Place/Time/Purpose of Delivery: Deliver to the Project Office as a part of the MSPSP (DID MA 3-7) for approval.	

DID MA 3-6: OPERATING AND SUPPORT HAZARD ANALYSIS (04-18-2008) (Continued)

Preparation Information:
The Contractor shall perform and document an operating and support hazard analysis (O&SHA) to examine procedurally controlled activities. The O&SHA shall: evaluate activities for hazards or risks introduced into the system by operational and support procedures, evaluate the adequacy of operational and support procedures used to eliminate, control, or abate identified hazards or risks, identify and evaluate hazards resulting from the implementation of operations or tasks performed by persons. It shall consider the following criteria: the planned system configuration and/or state at each phase of activity; the facility interfaces; the planned environments or the ranges thereof; the supporting tools or other equipment, including software controlled automatic test equipment, specified for use; operational and/or task sequence, concurrent task effects and limitations; biotechnological factors, regulatory or contractually specified personnel safety and health requirements; and the potential for unplanned events including hazards introduced by human errors. The human shall be considered an element of the total system, receiving both inputs and initiating outputs during the conduct of this analysis. The O&SHA shall identify the safety requirements or alternatives needed to eliminate or control identified hazards or to reduce the associated risk to a level that is acceptable under either regulatory or Range Safety specified criteria. The O&SHA shall indicate the need for revised tailoring of some requirements of this publication depending on the level of risk identified or the discovery of any previously unidentified hazards. The analysis shall identify the following:

- -Activities that occur under hazardous conditions, their time periods, and the actions required to minimize risk during these activities and time periods
- -Changes needed in functional or design requirements for system hardware and software, facilities, tooling, or support and test equipment to eliminate or control hazards or reduce associated risks.
- -Requirements for safety devices and equipment, including personnel safety and life support equipment.
- -Warnings, cautions, and special emergency procedures such as egress, rescue, escape, render safe, explosive ordnance disposal, and backout, including those necessitated by failure of a computer software-controlled operation to produce the expected and required safe result or indication.
- -Requirements for packaging, handling, storage, transportation, maintenance, and disposal of hazardous materials.
- - Requirements for safety training and personnel certification.
- - Effects of non-developmental hardware and

DID MA 3-7: MISSILE SYSTEM PRE-LAUNCH SAFETY PACKAGE (08-29-2008)

Title: Missile System Pre-launch Safety Package (MSPSP)	DID No.: MA 3-7
Reference: MAR Paragraph 3.2.3	
Use: The MSPSP provides a description of the payload design to support hazard analysis results, hazard analysis method, and other applicable safety related information. The Contractor shall include analyses identifying the ground operations hazards associated with the flight system, ground support equipment, and their interfaces. The Contractor shall take measures to control or minimize hazards. In addition to identifying hazards, the MSPSP documents controls and verification methods for each hazard in a Hazard Report. The analysis shall be updated as the hardware progresses through design, fabrication, and test. A list of hazardous/toxic materials with material safety data sheets and a description of the hazardous and safety critical operations associated with the payload shall be included in the final MSPSP. The safety assessment shall begin early in the program formulation process and continue throughout all phases of the mission lifecycle. The spacecraft or instrument Project Manager shall demonstrate compliance with these requirements and shall certify to GSFC and the launch range, through the MSPSP, that all safety requirements have been met.	
Related Documents: -AFSPCMAN 91-710, Range Safety User Requirements Manual (as applicable)	
Place/Time/Purpose of Delivery: -Deliver the Preliminary MSPSP to the Project Office thirty (30) days after Mission PDR for approval. -Deliver the Intermediate MSPSP to the Project Office thirty (30) days prior to Mission Critical Design Review (CDR) for approval. -Deliver the Final MSPSP to the Project Office sixty (60) days prior to Spacecraft/ Observatory shipment to Launch Range for approval. -Deliver the Final MSPSP to the Range Safety within ten (10) days after approval by the	

Project Office for approval.

NOTE: The Preliminary MSPSP delivery shall include necessary launch range safety requirements tailoring. See applicable launch range and launch vehicle requirements for details.

Preparation Information:

1. Introduction. State the purpose of the safety data package.
2. System Description. This Paragraph may be developed by referencing other program documentation such as technical manuals, System Program Plan, System Specification.
3. System Operations.
   a. A description of the procedures for operating, testing, and maintaining the system, including the safety features and controls.
   b. A description of special safety procedures needed to assure safe operations, test and maintenance, including emergency procedures.
   c. A description of anticipated operating environments and specific operator skills.
   d. A description of special facility requirements or personal equipment to support the system.

DID MA 3-7: MISSILE SYSTEM PRELAUNCH SAFETY PACKAGE (08-29-2008) (Continued)

4. Systems Safety Engineering Assessment. This Paragraph shall include:
   a. A summary of the criteria and methodology for classifying and ranking hazardous conditions.
   b. A description of the analyses and tests performed to identify inherent hazardous conditions, including the software safety analysis.
   c. Hazard Reports by subsystem or major component level.
      i. A discussion of the actions taken to eliminate or control these items.
      ii. A discussion of the effects of these controls on the probability of occurrence and severity level of potential mishaps.
      iii. A discussion of the residual risks that remain after the controls are applied or for which no controls could be applied.
      iv. A discussion of the results of tests conducted to validate safety criteria

requirements and analyses (these items should appear in the Verification Tracking Log).

5. Conclusions and Recommendations. This Paragraph shall include:
   a. An assessment of the results of the safety program efforts; a list of significant hazards and specific safety recommendations to ensure the safety of personnel and property.
   b. For hazardous materials:
      (1) Material identification as to type, quantity, and hazards.
      (2) Safety precautions and procedures for use, storage, transportation, and disposal.
      (3) A copy of the Material Safety Data Sheet (OSHA Form 20 or DD Form 1813).
   c. Appropriate radiation forms/analysis.
   d. Reference material to include a list of all pertinent references such as Test Reports, Preliminary Operating Manuals and Maintenance Manuals.
   e. Recommendations applicable to the safe interface of this system with the other system(s).
   f. A statement signed by the Contractor's System Safety Manager and Program Manager certifying that all identified hazards have been eliminated or controlled and that the system is ready to test, operate, or proceed to the next mission phase.

DID MA 3-8: VERIFICATION TRACKING LOG (07-15-2008)

Title: Verification Tracking Log	DID No.: MA 3-8

Reference:
MAR Paragraph 3.2.4

Use:
Provides documentation of a Hazard Control and Verification Tracking process as a closed-loop system to ensure that safety compliance has been satisfied in accordance to applicable launch range safety requirements.

Related Documents:
- AFSPCMAN 91-710, Range Safety User Requirements Manual (as applicable)

Place/Time/Purpose of Delivery:
- Deliver the Verification Tracking Log (VTL), identifying hazard controls that are not verified as closed, to the Project Office with the final MSPSP DID (MA 3-7) for review.
- After the Pre-Ship Review (PSR), deliver VTL updates to the Project Office weekly for review until all hazard controls are verified as closed.

Note: The Contractor shall close items with the appropriate rationale prior to first operational use or restraint.

Preparation Information:
The VTL provides documentation that demonstrates the process of verifying the control of all hazards by test, analysis, inspection, similarity to previously qualified hardware, or any combination of these activities. All verifications that are listed on the hazard reports shall reference the tests/analyses/inspections. Results of these tests/analyses/inspections shall be available for review and submitted in accordance with the contract schedule and applicable launch site range safety requirements.

The VTL shall contain the following information in tabular format:
- Hazard Report Number.

- Safety Verification Number.
- Description (Identify procedures/analyses by number and title).
- Constraints on Launch Site Operations.
- Independent Verification Required (e.g., mandatory inspection points).
- Scheduled Completion Date.
- Completion Date.
- Method of Closure.

DID MA 3-9: SAFETY VARIANCE (01-07-2009)

Title: Safety Variance	DID No.: MA 3-9

Reference:
MAR Paragraph 3.2.5

Use:
A Safety Variance documents a safety requirement that cannot be met and the rationale for approval of a waiver, exception, or deviation as defined in NPR 8715.3. Note: a variance may require Range Safety concurrence.

Related Documents (each as applicable):
- AFSPCMAN 91-710, Range Safety User Requirements Manual
- KNPR 8715.3, KSC Safety Practices Procedural Requirements
- NPR 8715.3, NASA General Safety Program Requirements

Place/Time/Purpose of Delivery:
- Deliver to the Project Office within thirty (30) days of identifying the need for a variance for approval.

Preparation Information:
The Contractor shall include the following information for the review of a variance request:
- A statement of the specific safety requirement and its associated source document name and paragraph number for which a variance is requested.
- A technical justification for the variance.
- Analyses to show the mishap potential of the proposed alternate requirement, method, or process as evaluated against the specified requirement.
- An assessment of the risk involved in accepting the variance; when it is determined that there are no hazards, the basis for such determination should be provided.
- A narrative on possible ways of reducing hazards severity and probability and existing compliance activities.
- Starting and expiration dates for variance, if applicable.

DID MA 3-10: ORBITAL DEBRIS ASSESSMENT (07-15-2008)

Title: Orbital Debris Assessment	DID No.: MA 3-10

Reference:
MAR Paragraph 3.2.6

Use:
Ensure NASA requirements for post mission orbital debris control are met.

Related Documents:
- NPR 8715.6A, NASA Procedural Requirements for Limiting Orbital Debris
- NASA-STD-8719.14, Process for Limiting Orbital Debris

Place/Time/Purpose of Delivery:
- Deliver preliminary package to the Project Office fifteen (15) days prior to mission PDR for review.
- Deliver final package to the Project Office sixty (60) days prior to mission CDR for approval.
- Deliver updates the final package to the Project Office for approval within thirty (30) days of identification of design changes that affect the assessment.

Preparation Information:
The assessment shall be done in accordance with NPR 8715.6A NASA Procedural Requirements for Limiting Orbital Debris and NASA-STD-8719.14 Process for Limiting Orbital Debris. The preliminary assessment is conducted to identify areas where the project may contribute debris and to assess this contribution relative to the guidelines. The final assessment conducted shall include comments on changes made since the preliminary assessment. The detail shall be consistent with the available information of design and operations. The Contractor shall submit updates to the final assessment for design changes after CDR that impact the potential for debris generation.

NOTE: Orbital Debris Assessment Software is available for download from Johnson Space Center at URL: http://sn-callisto.jsc.nasa.gov/mitigate/das/das.html

DID MA 3-11: MISHAP PREPAREDNESS AND CONTINGENCY PLAN (07-15-2008)

Title: Mishap Preparedness and Contingency Plan	DID No.: MA 3-11
Reference: MAR Paragraph 3.2.7	
Use: Ensure that requirements for mishap reporting are met.	
Related Documents: -NPR 8621.1, NASA Procedural Requirements for Mishap Reporting, Investigating, and Recordkeeping	
Place/Time/Purpose of Delivery: -Deliver to the Project Office thirty (30) days prior to mission PDR for review.	
Preparation Information: The Contractor shall prepare a Mishap Preparedness and Contingency Plan per the requirements of NPR 8621.1	

DID MA 3-12: MATERIAL SELECTION LIST FOR PLASTIC FILMS, FOAMS, AND ADHESIVE TAPES (11-04-2008)

Reference: MAR Paragraph 3.2.8
Use: Submitted to Launch Range Safety for assessment of flammability.
Related Documents: -KSC Form KTI-5212, Material Selection List for Plastic Films, Foams, and Adhesive Tapes
Place/Time/Purpose of Delivery: -Deliver to the Project Office with the Final MSPSP (DID MA 3-7) for review.
Preparation Information: The Contractor shall prepare the form per the requirements of related documents/forms. (See Appendix C for form information.)

DID MA 3-13: RADIATION FORMS AND ANALYSES (11-04-2008)

Title: Radiation Forms and Analyses	DID No.: MA 3-13
Reference: MAR Paragraph 3.2.8	
Use**:** The forms and analyses support the NASA launch safety approval process.	
Related Documents: - KNPR 1860.1, KSC Ionizing Radiation Protection Program - KNPR 1860.2, KSC Non-Ionizing Radiation Protection Program - KSC Form 16-450 NS, Radiation Training & Experience Summary (Non-Ionizing Radiation) - KSC Form 16-294 NS, Radiation Training & Experience Summary (Ionizing Radiation) - KSC Form 16-447, Laser Device Use Request/Authorization - KSC Form 16-451 NS, Radiofrequency/Microwave System Use Request/Authorization - KSC Form 16-295 NS, Radiation Use Request/Authorization (Radioactive Materials)	
Place/Time/Purpose of Delivery: -Deliver to the Project Office with the Final MSPSP (DID MA 3-7) for review.	
Preparation Information: The Contractor shall prepare the forms and analyses per the requirements of related documents/forms. (See Appendix C for form information.)	

DID MA 3-14: PROCESS WASTE QUESTIONNAIRE (10-31-2008)

Title: Process Waste Questionnaire	DID No.: MA 3-14
Reference: MAR Paragraph 3.2.8, MAR Appendix F	
Use: The forms and analyses support the NASA launch safety approval process.	
Related Documents: -KSC Form 26-551 V2, Process Waste Questionnaire	
Place/Time/Purpose of Delivery: -Deliver to the Project Office with the Final MSPSP (DID MA 3-7) for review.	
Preparation Information: The Contractor shall prepare the form and analyses per the requirements of related document/form. (See Appendix C for form information.)	

DID MA 3-15: ENVIRONMENTAL IMPACT STATEMENT (10-31-2008)

Title: Environmental Impact Statement	DID No.: MA 3-15
Reference: MAR Paragraph 3.2.8, MAR Appendix F	
Use: The forms and analyses support the NASA launch safety approval process	
Related Documents: -AF Form 813, Request for Environmental Impact Analysis	
Place/Time/Purpose of Delivery: -Deliver to the Project Office with the Final MSPSP (DID MA 3-7) for review.	
Preparation Information: The Contractor shall prepare the form and analyses per the requirements of related document/form. (See Appendix C for form information.)	

DID MA 4-1: PROBABILISTIC RISK ASSESSMENT (PRA) AND RELIABILITY PROGRAM PLAN AND REPORTS (02-19-2009)

Title: Probabilistic Risk Assessment (PRA) and Reliability Program Plan and Reports	DID No.: MA 4-1
Reference: MAR Paragraph 4.1	
Use: Planning and implementation of Probabilistic Risk Assessment (PRA) and reliability activities for safety critical functions.	
Related Documents: - NASA Policy Directive (NPD) 8720.1, NASA Reliability and Maintainability (R&M) Program Policy - NASA-STD-8729.1, Planning, Developing and Managing an Effective Reliability and Maintainability (R&M) Program - NPR 8705.4, Risk Classification for NASA Payloads - NPR 8705.5, Probabilistic Risk Assessment (PRA) Procedures for NASA Programs and Projects - NPR 8515.3, NASA General Safety Program Requirements	
Place/Time/Purpose of Delivery: - = - Deliver final plans to the Project Office fifteen (15) days prior to the Systems Requirements Review (SRR) for review. - Deliver activity reports related to implementation of the plans at milestone reviews beginning with the SRR for review. Note: Contractor may include PRA and Reliability Program Plan in the Project Level MAIP.	

Preparation Information:

The PRA and Reliability Program Plan shall include:

- A discussion of how the Contractor intends to implement and comply with PRA and Reliability program requirements.
- Charts and statements describing organizational responsibilities and functions conducting each task to be performed as part of the Program.
- A summary (matrix or other brief form) that indicates for each requirement, the organization responsible for implementing and generating the necessary documents.
- Identify the approval, oversight, or review authority for each task.
- Narrative descriptions, time or milestone schedules, and supporting documents describing the execution and management plan for each task.
- Documentation, methods, procedures, and reporting specific to each task in the plan.

DID MA 4-2: PROBABILISTIC RISK ASSESSMENT (02-19-2009)

Title: Probabilistic Risk Assessment	DID No.: MA 4-2
Reference: MAR Paragraph 4.2	
Use: To provide a structured and disciplined approach to: analyzing system risk; supporting management decisions; improving safety, operations, performing maintenance and upgrades; improving performance; and reducing cost for safety critical items only.	
Related Documents - NPR 8705.4, Risk Classification for NASA Payloads - NPR 8705.5, Probabilistic Risk Assessment (PRA) Procedures for NASA Programs and Projects - NPR 8715.3, NASA General Safety Program Requirements - PRA Procedures Guide for NASA Managers and Practitioners	
Place/Time/Purpose of Delivery: - Deliver interim report to the Project Office thirty (30) days prior to SRR for information. - Deliver updated interim report to the Project Office thirty (30) days prior to CDR for review. - Deliver updated interim report to the Project Office thirty (30) days prior to Mission Operations Review (MOR) for review. - Deliver final report to the Project Office thirty (30) days prior to Flight Operations Review (FOR) for review	
Preparation Information: The PRA shall be performed in accordance with NPR 8705.5 and include the following: - The objective and scope of the PRA for safety critical items only; - End-states-of-interest to the decision-maker; - Definition of the mission phases and success criteria;	

- Initiating event categories;
- Top level scenarios;
- Initiating and pivotal event models (e.g., fault trees and phenomenological event models), including assessments of common cause failure modes;
- Data development for probability calculations;
- Integrated model and quantification to obtain risk estimates;
- Assessment of uncertainties; and
- Summary of results and conclusions, including a ranking of the lead contributors to risk.

DID MA 4-3: FAILURE MODE AND EFFECTS ANALYSIS (FMEA) AND CRITICAL ITEMS LIST (CIL) (02-19-2009)

Title: Failure Mode and Effects Analysis (FMEA) and Critical Items List (CIL)	DID No.: MA 4-3
Reference: MAR Paragraph 4.3	
Use: Used to evaluate design against requirements, to identify single point failures and hazards, and to identify modes of failure within a system design for the early mitigation of potential safety critical functions only.	
Related Documents - GSFC Flight Assurance Procedure (FAP) P-322-208, Performing a Failure Mode and Effects Analysis - NPR 8705.4, Risk Classification for NASA Payloads	
Place/Time/Purpose of Delivery: - Deliver preliminary FMEA to the Project Office thirty (30) days before PDR for review. - Deliver final FMEA to the Project Office thirty (30) days prior to CDR for review. - Deliver updated FMEA and CIL to the Project Office thirty (30) days prior to each subsequent milestone review leading up to Launch for review.	

Preparation Information:

The FMEA Report shall include the following:

- A discussion of the approach of the analysis, methodologies, assumptions, results, conclusions, and recommendations.
- Objectives.
- Level of the analysis.
- Ground rules.
- Functional description.
- Functional block diagrams.
- Reliability block diagrams.
- Equipment analyzed.
- Data sources used.
- Problems identified.
- Single-point failure analysis, to include the root cause, mitigation, and retention rationale for those with severity categories 1, 1R, or 1S.
- Corrective actions.
- Work sheets identifying failure modes, causes, severity category, and effects at the item, next higher level, and mission level, detection methods, and mitigating provisions.
- CIL for severity categories 1, 1R, and 1S including item identification, cross-reference to FMEA line items, and retention rationale. Appropriate retention rationale may include design features, historical performance, acceptance testing, manufacturing product assurance, elimination of undesirable failure modes, and failure detection methods.

DID MA 4-4: FAULT TREE ANALYSIS (FTA) (02-19-2009)

Title: Fault Tree Analysis (FTA)	DID No.: MA 4-4
Reference: MAR Paragraphs 4.4	
Use: Used to assess failure of safety critical functions from the top level perspective. Undesired top-level states are identified and combinations of lower-level events are considered to derive credible failure scenarios. The technique provides a methodical approach to identify events or environments that can adversely affect safety and provides an informed basis for assessing system risks.	
Related Documents - NASA Fault Tree Handbook with Aerospace Applications - NPR 8705.4, Risk Classification for NASA Payloads - NPR 8715.3, NASA General Safety Program Requirements	
Place/Time/Purpose of Delivery: - Deliver quantitative FTA report to Project Office in support of safety critical pivotal event analysis as part of each PRA report for review.	
Preparation Information: The mission FTA Report shall contain: - Analysis ground rules including definitions of undesirable end states; - References to documents and data used; - Fault tree diagrams; and - Results and conclusions.	

DID MA 4-5: LIMITED-LIFE ITEMS LIST (02-19-2009)

Title: Limited-Life Items List	DID No.: MA 4-5
Reference: MAR Paragraph 4.11	
Use: Tracks the selection and application of limited-life items and the predicted impact on mission operations for safety critical functions only.	
Related Documents None	
Place/Time/Purpose of Delivery: -Deliver Limited-Life Items List to the Project Office thirty (30) days prior to PDR for review. -Deliver updates to the Project Office no later than thirty (30) days after changes are made for review.	
Preparation Information: The Contractor shall prepare and maintain a list of safety critical life-limited items and their predicted impact on mission operations. The list shall include expected life, required life, duty cycles, and rationale for selecting and using the item. The list may include such items as structures, thermal control surfaces, solar arrays, electromechanical mechanisms, batteries, compressors, seals, bearings, valves, tape recorders, momentum wheels, gyros, actuators and scan devices. The environmental or application factors that may affect the items include such things as atomic oxygen, solar radiation, shelf-life, extreme temperatures, thermal cycling, wear and fatigue.	

DID MA 5-1: SOFTWARE QUALITY ASSURANCE PLAN (04-23-2008)

Title: Software Quality Assurance Plan	DID No.: MA 5-1
Reference: MAR Paragraph 5.2	
Use: Documents the Contractor's Software Quality Assurance roles and responsibilities, surveillance activities, supplier controls, record collection, maintenance and retention, training, and risk management.	
Related Documents: - Institute of Electrical and Electronics Engineers (IEEE) Standard 730-2002, Software Quality Assurance Plans - NASA-STD-8739.8, NASA Standard for Software Assurance	
Place/Time/Purpose of Delivery: - Deliver preliminary plan to the Project Office fifteen (15) days prior to the SRR for review. - Deliver baseline plan to the Project Office fifteen (15) days prior to PDR for review. - Deliver updates to the Project Office fifteen (15) days prior to implementation for review.	
Preparation Information: The Software Quality Assurance Plan (SQAP) shall contain the following: - Purpose; - Reference documents and definitions; - Management; - Documentation; - Standards, practices, conventions, and metrics; - Software Reviews; - Test; - Problem Reporting and Corrective Action; - Tools, techniques, and methodologies;	

- Media control;
- Supplier control;
- Records, collection, maintenance, and retention;
- Training;
- Risk Management; and
- SQAP Change procedure and history.

DID MA 5-2: SOFTWARE VERIFICATION & VALIDATION PLAN (07-11-2008)

Title: Software Verification & Validation Plan	DID No.: MA 5-2

Reference:
MAR Paragraph 5.3

Use:
Documents the software V&V process which determines whether the development products of a given activity conform to the requirements of that activity and whether the software satisfies its intended use and user needs. This determination may include analysis, evaluation, review, inspection, assessment, and testing of the software products and processes. The V&V process shall be performed in parallel with the software development, not at the conclusion of the development effort.

Related Documents:
- NPR 7150.2, NASA Software Engineering Requirements
- IEEE Standard 1012-2004, IEEE Standard for Software Verification and Validation
- NASA-STD-8739.8, NASA Standard for Software Assurance
- IEEE Standard 1059-1993, IEEE Guide for Software Verification and Validation Plans

Place/Time/Purpose of Delivery:
- Deliver preliminary plan to Project Office thirty (30) days after DOAward for review.
- Deliver baseline plan to Project Office fifteen (15) days prior to SRR for review.
- Provide updates to Project Office fifteen (15) days prior to implementation for review.

Preparation information:Purpose
- Referenced documents.
- Definitions.
- V&V Overview:
  - Organization;
  - Master Schedule;
  - Software integrity level scheme;
  - Resource summary;
  - Responsibilities; and

- Tools, techniques, and methods.
- V&V Processes:
  - Process: Management;
    - Activity: Management of V&V;
  - Process: Acquisition;
    - Activity: Acquisition of support V&V;
  - Process: Supply;
    - Activity: Planning V&V;
  - Process: Development;
    - Activity: Concept V&V;
    - Activity: Requirements V&V;
    - Activity: Design V&V;
    - Activity: Implementation V&V;
    - Activity: Test V&V;
    - Activity: Installation and Checkout V&V;

DID MA 5-2: SOFTWARE VERIFICATION & VALIDATION PLAN (Continued)

  - Process: Operations;
    - Activity: Operations V&V;
  - Process: Maintenance; and
    - Activity: Maintenance V&V.
- V&V Reporting Requirements:
  - Tasks reports;
  - Activity: summary reports;
  - Anomaly reports;
  - V&V final reports;
  - Special studies reports (optional); and
  - Other reports (optional).
- V&V Administrative requirements:
  - Anomaly resolution and reporting;

- Task iteration policy;
- Deviation policy;
- Control procedures; and
- Standards, practices, and conventions.

- V&V test documentation requirements.

DID MA 5-3: SOFTWARE CONFIGURATION MANAGEMENT PLAN (05-29-2008)

Title: Software Configuration Management Plan	DID No.: MA 5-3
Reference: MAR Paragraph 5.5	
Use: The purpose of the Software Configuration Management Plan is to define the software configuration management system, roles and responsibilities, activities, schedules, resources, and plan maintenance.	
Related Documents: - ANSI-IEEE Standard 828-2005, IEEE Standard for Software Configuration Management Plans - ANSI-IEEE Standard 1042-1987, IEEE Guide to Software Configuration Management - NPR 7150.2, NASA Software Engineering Requirements	
Place/Time/Purpose of Delivery: - Deliver preliminary plan to the Project Office thirty (30) days after DO award for review. - Deliver baseline plan to the Project Office fifteen (15) days prior to SRR for review. - Deliver updates to the plan to the Project Office fifteen (15) days prior to implementation for review.	
Preparation Information: The Contractor shall develop, maintain, manage, and implement a Software Configuration Management (SCM) system that provides baseline management and control of software requirements, design, source code, data, and documentation. The SCM system shall be applied to all deliverables and designated non-deliverable software products. The Contractor shall document the SCM system, and associated tools, within the plan. The plan shall address configuration identification, configuration control, configuration status accounting, and configuration audits and reviews. As part of SCM, the Contractor shall employ a source code version control tool (e.g.,	

ClearCase, Starbase) that allows Contractors to check in/check out current or previous versions of a source file. The Contractor shall also use a requirements management tool (e.g., DOORS) to manage the software requirements baseline. The Contractor shall document and implement a process for Software Problem Reporting and Corrective Action that addresses reporting, analyzing, and tracking software non-conformances throughout the development lifecycle. Software Problem Reporting can be included as part of Contractor's overall project Problem Reporting and Corrective Action Plan.

The Software Configuration Management (SCM) Plan shall follow the following format:

- Introduction – Purpose, scope, definitions and references.
- SCM Management Overview – Organization, responsibilities, and interfaces and relationships to software life cycle.
- Software Configuration Management Activities: 1) Configuration Identification, 2) Configuration Control, 3) Configuration Status Accounting, 4) Configuration Audits, 5) Interface Control, 6) Subcontractor control.
- Software Configuration Management Schedules.

DID MA 5-3: SOFTWARE CONFIGURATION MANAGEMENT PLAN (Continued)

- Software Configuration Management Resources – tools, techniques, equipment, personnel, and training.
- Software Configuration Management Plan Maintenance.

Note: SCM Plan may be contained in Contractor Project CM Plan or Software Management Plan.

DID MA 5-4: SOFTWARE VERSION DESCRIPTION DOCUMENT (01-09-2009)

Title: Software Version Description Document (VDD)	DID No.: MA 5-4
Reference: MAR Paragraph 5.7	
Use: A Version Description Document (VDD) shall be the primary configuration control document used to track and control versions of software released to testing, implementation, or the final operational environment. The VDD identifies and documents the version of the computer software configuration items (CSCI's) and other deliverables that comprise the software build or release, including changes since the last VDD was issued.	
Related Documents: - NPR 7150.2, NASA Software Engineering Requirements, Section 5.2.8	
Place/Time/Purpose of Delivery: - Deliver to the Project Office with each build or release for information.	
Preparation Information: The Version Description Document shall include/address: - Established Baseline – identifies the delivered system and software (e.g., type, version numbers, release numbers, date, and location). - New Features and/or Requirements Implemented and Delivered. - Planned Features Absent from this version. - List of Outstanding Change Requests (CRs), Discrepancy Reports (DRs), and workarounds (if applicable) against this release. - List of CRs and DR's implemented since the previous version. - Any Significant Changes in Operations. - Applicable Documents associated with this release (e.g., user guides). - Installation instructions on how to build the system (including tools, operating systems, assemblers, compilers, libraries, existing software, data files, and	

delivered software). Note: All version numbers shall be provided.

- Information from any Configuration Audits performed prior to the delivery (to ensure that the correct versions were delivered with the correct functionality).

2.1.2

DID MA 5-5: SOFTWARE STATUS REPORT (01-09-2009)

Title: Software Status Report	DID No.: MA 5-5

Reference:
MAR Paragraph 5.8

Use:
Software Assurance Status Report provides information regarding current status and future activities.

Related Documents:
- ANSI-IEEE Standard 828-2005, IEEE Standard for Software Configuration Management Plans
- ANSI-IEEE Standard 1042-1987, Guide to Software Configuration Management
- NPR 7150.2, NASA Software Engineering Requirements

Place/Time/Purpose of Delivery:
- Deliver to Project Office monthly beginning sixty (60) days after DO award for information.

Preparation Information:
As part of the Project Monthly Status Reports, the Contractor shall include the following software assurance activities:
- Organization and key personnel changes.
- Assurance accomplishments and resulting software assurance metrics (e.g., for activities such as inspection and test, reviews, contractor/subcontractor surveys, and audits).
- Subcontractor assurance accomplishments.
- Trends in software quality metric data (e.g., total number of software problem reports, including the number of problem reports that were opened and closed in that reporting period).
- Significant problems or issues.
- Plans for upcoming software assurance activities.
- Lessons Learned.

DID 6-1: GROUND SYSTEMS AND EQUIPMENT (02-18-2009)

Title: Ground Systems and Equipment Plan	DID No.: MA 6-1
Reference: MAR Paragraph 6.1	
Use: Documents the Contractor's plan for ground support equipment that will be used in the development of ground operations equipment and flight items.	
Related Documents: - NASA-STD-8719.9 Standard for Lifting Devices and Equipment - GSFC-STD-1000 Rules for the Design, Development, Verification, and Operation of Flight Systems	
Place/Time/Purpose of Delivery: - Deliver to the Project Office thirty (30) days prior to SRR for approval.	
Preparation Information: The Contractor's plan shall address the ground systems and equipment requirements with respect to procurement, development, test, operation, and maintenance for both ground systems and flight systems. The plan shall address support to flight items to the extent necessary to assure functional integrity of flight items, including health and safety. The Contractor shall document a plan that: - Identifies GSE functions necessary to develop and test flight and ground operations items - Develops and builds the GSE The program shall address: - Requirements definition, management, traceability, and verification. - Verification and validation. - Acceptance criteria for testing.	

- Configuration control (functional and physical).
- Interface control drawings.
- Critical Interfaces.
- Testing.
- User/operational manuals.
- Mechanical stress analysis.
- Items that directly interface with flight items and are required to be built and maintained to the same standards.
- Analyses required to prevent induced damage to flight items.

DID MA 7-1: RISK MANAGEMENT PLAN (04-18-2008)

Title: Risk Management Plan	DID No.: MA 7-1
Reference: MAR Paragraph 7.1	
Use: Defines the process by which the Contractor identifies, evaluates, and mitigates the risks associated with program, project, and/or mission goals	
Related Documents: - NPR 8000.4, Agency Risk Management Procedures and Guidelines	
Place/Time/Purpose of Delivery: - Deliver to the Project Office fifteen (15) after contract award for approval.	

Preparation Information:
The Risk Management Plan shall include:

- Description of contract requirements.
- Purpose and Scope.
- Assumptions, Constraints, and Policies.
- Related Documents and Standards.
- Risk Management Process Summary (Philosophy, Integration).
- Risk Management Organization:
  - -Roles and Responsibilities;
  - -Risk Management Review Board;
  - -Standard Practices; and
  - -Communication.
- Risk Attributes that will be used to classify risks;
  - -As a minimum attributes shall be defined for safety, cost, schedule, and technical or performance areas.
- Risk buy-down chart (waterfall chart).
- Criteria for prioritization of risks.
- Mitigation plan content.
- Process Details:
  - -Baselines;
  - -Database (Use, Access, Updates, Responsibilities, etc.);
  - -Identifying Risks;
  - -Analyzing Risks;
  - -Planning, Actions;
  - -Tracking (metrics and their use);
  - -Control; and
  - -Documentation and Reporting.

DID MA 7-2: RISK LIST (04-18-2008)

Title: Risk List	DID No.: MA 7-2
Reference: MAR Paragraph 7.2	
Use: Defines the documentation and reporting of risk items.	
Related Documents: -GSFC-STD-0002, Risk Management Reporting -NPR 8000.4, Agency Risk Management Procedural Requirements	
Place/Time/Purpose of Delivery: -Deliver to the Project Office fifteen (15) days prior to each milestone review beginning with PDR for review	

Preparation Information:

Prepare a prioritized list of risks that shall include:

- -Identification number;
- -Title;
- -Current approach (mitigate, watch, accept, research);
- -Rank; and
- -Trend.

Prepare a chart for each risk that includes:

- -Identification number;
- -Title;
- -Rank;
- -Risk statement (condition-consequence form);
- -Brief discussion of:
  - -Current approach;
  - -Actions causing change; and
  - -Current status.

DID MA 8-1: SYSTEMS REVIEW MATERIALS (04-18-2008)

Title: Systems Review Materials	DID No.: MA 8-1
Reference: MAR Paragraph 8.1	
Use: To provide the systems review team with the materials used to conduct the review.	
Related Documents -Project Systems Review Plan provided by the Project Office -GSFC-STD-1001 Criteria for Flight Project Critical Milestone Reviews	
Place/Time/Purpose of Delivery: -Provide the review agenda to the Project Office fourteen (14) days prior to commencement of the review for information. -Provide the review presentation materials to the Project Office seven (7) days prior to the review for information. -Provide review related reference materials to the Project Office at the review for information.	
Preparation Information: -See the guidelines presented in the Related Documents listed above.	

DID MA 8-2: REQUEST FOR ACTION (RFA) RESPONSES (04-18-2008)

Title: Request for Action (RFA) Responses	DID No.: MA 8-2
Reference: MAR Paragraph 8.1	
Use: To respond to action items resulting from the review.	
Related Documents - Project Systems Review Plan (provided by Project Office) - GSFC-STD-1001, Criteria for Flight Project Critical Milestone Reviews	
Place/Time/Purpose of Delivery: - Provide response to action items to the Project Office thirty (30) days after end of review for approval.	
Preparation Information: -See the guidelines presented in the related documents.	

DID MA 8-3: PEER REVIEW PROGRAM PLAN (04-18-2008)

Title: Peer Review Program Plan	DID No.: MA 8-3
Reference: MAR Paragraph 8.2	
Use: To provide the basis for conducting the Contractor's peer review program.	
Related Documents - GPR 8700.6, Engineering Peer Reviews	
Place/Time/Purpose of Delivery: - Provide to the Project Office sixty (60) days after DO award for review	
Preparation Information: -See the guidelines presented in the related document.	

DID MA 9-1: SYSTEM PERFORMANCE VERIFICATION PLAN (04-18-2008)

Title: System Performance Verification Plan	DID No.: MA 9-1
Reference: MAR Paragraph 9.1	
Use: Establishes the System Performance Verification Plan.	
Related Documents: -GSFC-STD-7000, General Environmental Verification Standard (GEVS) for GSFC Flight Programs and Projects	
Place/Time/Purpose of Delivery: -Deliver preliminary plan to Project Office ninety (90) days after contract award for review -Deliver final plan to Project Office thirty (30) days prior to CDR for approval	
Preparation Information: The System Performance Verification Plan shall be prepared to comply with the requirements of paragraph 2.1.1.1 of GSFC-STD-7000.	

DID MA 9-2: ENVIRONMENTAL VERIFICATION PLAN (04-18-2008)

Title: Environmental Verification Plan	DID No.: MA 9-2
Reference: MAR Paragraph 9.2	
Use: Establishes the Environmental Verification Plan.	
Related Documents: - GSFC-STD-7000 General Environmental Verification Standard (GEVS) for GSFC Flight Programs and Projects	
Place/Time/Purpose of Delivery: - Provide preliminary plan to Project Office sixty (60) days after DO award for review. - Provide final plan to Project Office thirty (30) days prior to CDR for approval.	
Preparation Information: The Environmental Verification Plan shall be prepared to comply with the requirements of paragraph 2.1.1.1.1 of GSFC-STD-7000.	

DID MA 9-3: SYSTEM PERFORMANCE VERIFICATION MATRIX (04-18-2008)

Title: System Performance Verification Matrix	DID No.: MA 9-3
Reference: MAR Paragraph 9.3	
Use: Establishes the System Performance Verification Matrix.	
Related Documents: -GSFC-STD-7000, General Environmental Verification Standard (GEVS) for GSFC Flight Programs and Projects	
Place/Time/Purpose of Delivery: -Deliver the updated Matrix in the data packages for reviews beginning with PDR for review.	
Preparation Information: The System Performance Verification Matrix shall be prepared and maintained per the requirements of paragraph 2.1.1.2 of GSFC-STD-7000.	

DID MA 9-4: ENVIRONMENTAL TEST MATRIX (04-18-2008)

Title: Environmental Test Matrix	CDRL No.: MA 9-4
Reference: MAR Paragraph 9.4	
Use: Establishes a matrix that summarizes the environmental tests and test status for flight hardware and other equipment.	
Related Documents: - GSFC-STD-7000, General Environmental Verification Standard (GEVS) for GSFC Flight Programs and Projects	
Place/Time/Purpose of Delivery: - Deliver the updated matrix in the review data package for reviews beginning with PDR for review.	
Preparation Information: Guidelines for environmental test matrices are in paragraph 2.1.1.2.1 of GSFC-STD-7000. An example of an environmental test matrix is given in Figure 2.1-1	

DID MA 9-5: VERIFICATION REPORTS (04-18-2008)

Title: Verification Reports	CDRL No.: MA 9-5
Reference: MAR Paragraph 9.5	
Use: Establishes the requirement to submit Verification Reports.	
Related Documents: - GSFC-STD-7000, General Environmental Verification Standard (GEVS) for GSFC Flight Programs and Projects	
Place/Time/Purpose of Delivery: - Deliver preliminary verification report to Project Office within seventy-two (72) hours of test completion for information. - Deliver final verification report = to Project Office within thirty (30) days of test completion for information.	
Preparation Information: The Verification Reports shall be prepared to comply with the requirements of paragraph 2.1.1.5 of GSFC-STD-7000.	

DID MA 9-6: SYSTEM PERFORMANCE VERIFICATION REPORT (04-18-2008)

Title: System Performance Verification Report	CDRL No.: MA 9-6
Reference: MAR Paragraph 9.6	
Use: Establishes a Performance Verification Report that compares hardware/software specifications with the final verified values.	
Related Documents: - GSFC-STD-7000 General Environmental Verification Standard (GEVS) for GSFC Flight Programs and Projects	
Place/Time/Purpose of Delivery: - Deliver updated reports with the review data package at reviews beginning with PDR for information. - Deliver the final report within thirty (30) days after completion of on-orbit checkout for information.	
Preparation Information: The System Performance Verification Report shall be prepared and maintained per paragraph 2.1.1.6 of GSFC-STD-7000.	

DID MA 10-1: ESD CONTROL PLAN (04-18-2008)

Title: ESD Control Plan	CDRL No.: MA 10-1
Reference: MAR Paragraph 10.3	
Use: Implementation of an ESD control program at the Contractor's and subcontractors' facilities.	
Related Documents: -ANSI/ESD S20.20, For the Development of an Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices)	
Place/Time/Purpose of Delivery: Deliver plan to the Project Office fifteen (15) days prior to SRR for review.	

DID MA 11-1: PARTS CONTROL PROGRAM PLAN (02-19-2009)

Title: Parts Control Program Plan	DID No.: MA 11-1
Reference: MAR Paragraph 11.1	
Use: Development and implementation of an EEE parts control program that addresses the system requirements for mission lifetime and reliability.	
Related Documents -GSFC EEE-INST-002, Instructions for EEE Parts Selection, Screening, Qualification, and Derating -S-311-M-70, Specification for Destructive Physical Analysis	
Place/Time/Purpose of Delivery: -Deliver the PCP Plan to the Project Office fifteen (15) days after DO award for approval.	
Preparation Information: The PCP shall address the following: - Shelf life control plan; - Parts application derating; - Supplier and manufacturer surveillance; - ASICs, Gate Arrays, System-on-chip, Custom Integrated Circuits (ICs); - Radiation hardness assurance; - Handling, preservation, and packing; - Contamination control; - Traceability and lot control; and - Failure analysis.	

DID MA 11-2: PARTS CONTROL BOARD OPERATING PROCEDURES
(02-13-2008)

Title: Parts Control Board Operating Procedures	DID No.: MA 11-2
Reference: MAR Paragraph 11.2	
Use: Organization and operation of the Parts Control Board regarding the implementation of the Parts Control Program.	
Related Documents -Parts Control Program Plan (DID MA 11-1)	
Place/Time/Purpose of Delivery: Deliver the Parts Control Board operating procedures to the Project Office thirty (30) days after DO award for review.	
Preparation Information: The Contractor shall address the following in the Parts Control Board procedures: - Organization and membership; - Meeting schedule; - Meeting notices; - Distribution of meeting agenda, notes, and minutes; and - Review and approval responsibilities and processes.	

DID MA 11-3: PROJECT APPROVED PARTS, LIST (10-21-2008)

Title: Project Approved Parts List (PAPL)	DID No.: MA 11-3
Reference: MAR Paragraph 11.3.1	
Use: A list of EEE parts that are approved by the Parts Control Board for use in flight hardware.	
Related Documents -Parts Control Program Plan (DID MA 11-1)	
Place/Time/Purpose of Delivery: -Deliver EEE parts information to be added to the PAPL to the Parts Control Board ten (10) business days prior to the PCB meeting at which the parts shall be presented for PCB approval. Deliver parts information to the Project Office for review.	
Preparation Information: The PAPL shall contain the following information: - Flight component identity to the circuit board level; - Complete part number (i.e. DSCC part number, SCD part number, with all suffixes); - Manufacturer's Generic Part number; - Manufacturer (not distributor); - Part Description (please include meaningful detail); - Federal Supplier Code (FSC); - Procurement Specification; - Comments and clarifications, as appropriate; - Quantity Required; - Procurement Part Number; - Flight Part Number (if different from the procurement part number); - Package Style/Designation; - Single Event Latch-up (SEL) Hardness/Tolerance and Data Source; - Single Event Upset (SEU) Hardness/Tolerance and Data Source; - Total Ionizing Dose (TID) Hardness/Tolerance and Data Source;	

- Displacement Damage Hardness/Tolerance and Data Source;
- Proton Hardness/Tolerance and Data Source;
- PCB Status;
- PCB Approval Date;
- PCB Required Testing/Evaluations; and
- GIDEP Alert Information. (See DID MA 15-1.)

DID MA 11-4: AS DESIGNED PARTS LIST (ADPL) (10-21-2008)

Title: As Designed Parts List (ADPL)	DID No.: MA 11-4
Reference: MAR Paragraph 11.3.2	
Use: A list of EEE parts that are designed into in flight hardware.	
Related Documents -Parts Control Program Plan (DID MA 11-1)	
Place/Time/Purpose of Delivery: -Deliver EEE Parts information to be added to the ADPL to the Parts Control Board ten (10) business days prior to the PCB meeting at which they shall be presented for PCB approval. Deliver parts information to the Project Office for review.	
Preparation Information: The As Designed Parts List (ADPL) shall contain all PAPL fields plus the following information: - Assembly Name/Number; - Next Level of Assembly; - Need Quantity; - Reference Designator(s); and - Item number (if applicable).	

DID MA 11-5: AS BUILT PARTS LIST (ABPL) (02-19-2009)

Title: As Built Parts List (ABPL)	DID No.: MA 11-5
Reference: MAR Paragraph 11.3.3	
Use: A list of EEE parts that are used in the flight hardware.	
Related Documents -Parts Control Program Plan (DID MA 11-1)	
Place/Time/Purpose of Delivery: 1.Deliver information for EEE Parts to be added to the As Built Parts List to the Parts Control Board ten (10) business days prior to the PCB meeting at which the parts shall be approved by the PCB. Deliver parts information to the Project Office for review. 2.Deliver the As Built Parts List to the Project Office fifteen (15) business days prior to the PSR for review.	
Preparation Information: The As Built Parts List (ABPL): shall contain all ADPL fields plus the following minimum information: - Assembly serial number; - Next Level of Assembly serial number; - Lot/Date/Batch/Manufacturing Code, as applicable; - Manufacturer's Commercial and Government Entity (CAGE) Code (specific plant location preferred); - Distributor/supplier, if applicable; and - Part serial number, if applicable.	

DID MA 12-1: MATERIALS AND PROCESSES SELECTION, IMPLEMENTATION, & CONTROL PLAN (02-19-2009)

Title: Materials and Processes Selection, Implementation, & Control Plan	DID No.: MA 12-1
Reference: MAR Paragraph 12.1	
Use: Defines the implementation of NASA-STD-6016 with the prescribed changes.	
Related Documents: NASA-STD-6016, Standard Materials and Processes Requirement for Spacecraft	
Place/Time/Purpose of Delivery: -Deliver to the Project Office 15 (15) days prior to the SRR for approval.	
Preparation Information: For each paragraph in Paragraphs 4 and 5 of NASA-STD-6016 with the prescribed changes, the plan shall state the requirement from NASA-STD-6016, identify the degree of conformance under the subheading "Degree of Conformance," and identify the method of implementation under the subheading "Method of Implementation." The plan shall address the following: - Conformance to the requirements of NASA-STD-6016 with the prescribed changes and describe the method of implementation. - Organizational authority and responsibility for review and approval of Materials and Processes (M&P) specified prior to release of engineering documentation. - Identification and documentation of Materials and Processes. - Procedures and data documentation for proposed test programs to support materials screening and verification testing. - Materials Usage Agreement (MUA) Procedures. - Determination of material design properties, including statistical approaches to be employed. - Identification of process specifications used to implement requirements in NASA-	

STD-6016.

ROBOTIC MISSIONS

- In paragraph 4.1.2, the Contractor may use GFSC forms or the Contractor's equivalent forms in lieu of the Materials and Processes Technical Information System (MAPTIS) format.
- The Contractor may use the GSFC outgassing database in addition to MAPTIS (URL http://outgassing.nasa.gov).
- The Contractor shall use AFPCMAN 91-710, Range Safety Users Requirements Manual, Volume 3, section 10.1 in place of paragraph 4.2.1.
- In addition to the requirements of paragraph 4.2.3.4, the Contractor shall qualify all lubricated mechanisms either by life testing in accordance with a life test plan or heritage with an identical mechanism used in an identical application (DID 12-3).

DID MA 12-1: MATERIALS AND PROCESSES SELECTION, IMPLEMENTATION, & CONTROL PLAN (Continued)

- In addition to the requirements of paragraph 4.2.3.6, the Contractor shall provide the vacuum bake out schedule for materials that fail outgassing requirements with the MIUL or MUA.
- Paragraph 4.2.3.8 does not apply.
- In paragraph 4.2.5.1, the Contractor shall develop and implement a Non-Destructive Evaluation only for fracture critical flight hardware.
- In paragraph 4.2.6.5, the Contractor shall use 541-PG-8072.1.2 GSFC Fastener Specification in place of NASA-STD-(I)-6008.

2.1.3

DID MA 12-2: LIFE TEST PLAN AND REPORTS FOR LUBRICATED MECHANISMS (04-18-2008)

Title: Life Test Plan and Reports for Lubricated Mechanisms	DID No.: MA 12-2
Reference: MAR Paragraph 12.2	
Use: Defines the life test evaluation process, acceptance criteria, and reporting for lubricated mechanisms.	
Related Documents: - NASA-STD-6016, Standard Materials and Processes Requirement for Spacecraft - NASA-Technical Memorandum (TM)-86556, Lubrication Handbook for the Space Industry (Part A: Solid Lubricants, Part B: Liquid Lubricants) - NASA/Contractor Report (CR)-2005-213424, Lubrication for Space Applications	
Place/Time/Purpose of Delivery: - Deliver plan to the Project Office thirty (30) days prior to PDR for approval. - Deliver test report to the Project Office thirty (30) days after mechanism acceptance test completion for review.	
Preparation Information: The Life Test Plan for Lubricated Mechanisms shall contain: -Table of Contents. -Description of lubricated mechanisms, performance functions, summary of subsystem specification, and life requirements. -Heritage of identical mechanisms and descriptions of identical applications. -Design, drawings, and lubrication system used by the mechanism. -Test plan, including vacuum, temperature, and vibration test environmental conditions. -Criteria for a successful test. The final report shall include (at a minimum) the following information for each lubricated mechanism life test: -Test plan;	

-Test data;
-Narrative on test results; and
-Summary of test conclusions.

DID MA 12-3: MATERIALS USAGE AGREEMENT (02-19-2009)

Title: Materials Usage Agreement (MUA)	DID No.: MA 12-3
Reference: MAR Paragraph 12.3	
Use: Establishes the process for submitting an MUA for a material or process that does not meet the requirements of NASA-STD-6016 and does not affect reliability or safety when used per the Materials and Processes Selection, Control, and Implementation Plan.	
Related Documents: - NASA-STD-6016, Standard Materials and Processes Requirement for Spacecraft - MSFC-STD-3029, Guidelines for the Selection of Metallic Materials for Stress Corrosion Cracking Resistance in Sodium Chloride Environments	
Place/Time/Purpose of Delivery: - Initial Submission: Deliver all MUAs prepared up to that date to the Project Office thirty (30) days prior to CDR for approval. - After the Initial Submission of MUAs: Deliver new or revised MUAs to the Project Office within thirty (30) days of their identification for approval.	
Preparation Information: The MUA package shall include the technical information required by the Related Documents listed above to justify the application. MUAs for stress corrosion shall include a Stress Corrosion Cracking Evaluation Form per MSFC-STD-3029 and a stress analysis. (See NASA-STD-6016.)	

DID MA 12-4: MATERIALS IDENTIFICATION AND USAGE LIST (MIUL)
(02-19-2009)

Title: Materials Identification and Usage List (MIUL)	DID No.: MA 12-4
Reference: MAR Paragraph 12.4	
Use: Establishes the Materials Identification and Usage List (MIUL).	
Related Documents: - NASA-STD-6016, Standard Materials and Processes Requirement for Spacecraft	
Place/Time/Purpose of Delivery: - Deliver to the Project Office thirty (30) days prior to PDR for review. - Deliver updates to the Project Office within thirty (30) days of identification for review.	
Preparation Information: The MIUL shall be delivered in a MAPTIS compatible form and shall identify the following information as applicable to the material or process: - Material form; - Material manufacturer and manufacturer's designation; - Material specification; - Process specification; - Environment; - Weight; - Material code; - Standard/commercial part number; - System and subsystem; - Maximum and minimum temperature; - Fluid type; - Surface Area; - Project;	

- Cure schedule; and
- GIDEP Alert Information. (See DID MA 15-1.)

DID MA 12-5: NONDESTRUCTIVE EVALUATION PLAN (02-19-2009)

Title: Nondestructive Evaluation Plan	DID No.: MA 12-5
Reference: MAR Paragraph 12.5	
Use: Establishes the Non-Destructive Evaluation (NDE) plan for the procedures and specifications employed in the inspection of materials.	
Related Documents: - NASA-STD-6016, Standard Materials and Processes Requirement for Spacecraft - MIL-HDBK-6870, Inspection Program Requirements, Nondestructive for Aircraft and Missile Materials and Parts - NASA-STD-5009, Nondestructive Evaluation Requirements for Fracture-Critical Metallic Components	
Place/Time/Purpose of Delivery: - Deliver to the Project Office thirty (30) days prior to PDR for review. - Deliver updates to the Project Office thirty (30) days after identification for review.	
Preparation Information: - The NDE Plan shall describe the process for establishment, implementation, execution and control of NDE. The plan shall meet the intent of MIL-HDBK-6870s and NASA-STD-5009 as specified by NASA-STD-6016. The plan shall define NDT planning and requirements to include the following: - Hardware Design; - Manufacturing Planning; - Personnel Training; - NDE Reliability Requirements for Fracture Critical Parts; and - NDE Reporting.	

DID MA 12-6: PRINTED WIRING BOARDS (PWB) TEST COUPONS AND/OR COUPON ANALYSIS REPORTS (04-18-2008)

Title: Printed Wiring Board (PWB) Test Coupons	DID No.: MA 12-6
Reference: MAR Paragraph 12.6	
Use: PWB test coupons are evaluated to validate that PWBs are suitable for use in space flight and mission critical ground applications.	
Related Documents: - IPC-6011, Generic Performance Specifications for Printed Boards (Class 3 Requirements) - IPC-6012B, Qualification and Performance Specification for Rigid Printed Boards (Class 3/A Requirements /Performance Specification Sheet for Space and Military Avionics) - IPC-6013B, Qualification and Performance Specification for Flexible Printed Boards (Class 3 Requirements) - IPC-6018A, Microwave End Product Board Inspection and Test - IPC A-600G, Guidelines for Acceptability of Printed Boards (Class 3 Requirements)	
Place/Time/Purpose of Delivery: - Deliver test coupons and supporting manufacturing information traceable to the flight boards to the Project Office or to a Customer/Project Office-approved laboratory as soon as practicable for analysis of the printed wiring boards for approval. - In the case that a Project Office/Customer-approved laboratory is used, deliver the coupon analysis report/laboratory results to the Project Office within ten (10) days of receipt from the laboratory for approval.	
Preparation Information: -Notify Project Office/Customer regarding shipment of PWB test coupons. -Laboratory coupon analysis report format is acceptable.	

DID MA 13-1: CONTAMINATION CONTROL PLAN AND DATA (04-18-2008)

Title: Contamination Control Plan and Data	DID No.: MA 13-1

Reference:
MAR Paragraph 13.1

Use:
To establish contamination allowances, methods for controlling contamination, and record test results.

Related Documents:
- GSFC-STD-7000, General Environmental Verification Standard (GEVS) for GSFC Flight Programs and Projects
- GSFC-STD-1000, Rules for the Design, Development, Verification, and Operation of Flight Systems
- ASTM E595-07, Standard Test Methods for Total Mass Loss and Collected Volatile Condensable Materials from Outgassing in a Vacuum Environment
- Outgassing Data for Selecting Spacecraft Materials (URL: http://outgassing.nasa.gov/)

Place/Time/Purpose of Delivery:
- Deliver initial plan to the Project Office thirty (30) days before PDR for GSFC review.
- Deliver final plan to the Project Office thirty (30) days before the CDR for approval.
- Deliver final thermal vacuum bakeout results to the Project Office within thirty (30) days of completion for review.
- Deliver contamination certificate of compliance with the End Item Acceptance Data Package (DID MA16-1) for review.

Preparation Information:
The Contractor shall provide: material properties data; design features; test data; system tolerance of degraded performance; and methods to prevent degradation. The items below shall be addressed in the plan:
- Beginning of life and end of life contamination requirements for contamination sensitive surfaces or subsystems.
- Methods and procedures used to measure and maintain the levels of cleanliness required

during each of the various phases of the item's lifetime (e.g., protective covers, environmental constraints, purges, cleaning/monitoring procedures).
- Materials:
    - Outgassing as a function of temperature and time;
    - Nature of outgassing chemistry; and
    - Areas, weight, location, view factors of critical surfaces.
- Venting: size, location and relation to external surfaces.
- Thermal vacuum test contamination monitoring plan, to include vacuum test data, QCM location and temperature, pressure data, system temperature profile, and shroud temperature.
- On-orbit spacecraft and instrument performance as affected by contamination deposits.
    - Contamination effect monitor;
    - Methods to prevent and recover from contamination in orbit;
    - Evaluation of on-orbit degradation

DID MA 13-1: CONTAMINATION CONTROL PLAN AND DATA (Continued)

    - Photopolymerization of outgassing products on critical surfaces;
    - Space debris risks and protection; and
    - Atomic oxygen erosion and re-deposition.
- Analysis of contamination impact on the satellite on orbit performance.
- In orbit contamination impact from other sources such as the Space Transportation System (STS), space station, and adjacent instruments.
- Ground/Test support equipment controls to prevent contamination of flight item(s).
- Facility controls and processes to maintain hardware integrity (protection and avoidance).
- Training.
- Data package on test results for materials and as-built product.

DID MA 15-1: GIDEP ALERT / NASA ADVISORY DISPOSITIONS (04-18-2008)

Title: GIDEP Alert / NASA Advisory Dispositions	DID No.: MA 15-1
Reference: MAR Paragraph 15.4	
Use: Document the Contractor's disposition of GIDEP ALERTs; GIDEP SAFE-ALERTs; GIDEP Problem Advisories; GIDEP Agency Action Notices; NASA Advisories and component issues, hereinafter referred to collectively as "Alerts" with respect to parts and materials used in NASA product.	
Related Documents: - S0300- BT-PRO-010, GIDEP Operations Manual - S0300-BU-GYD-010, GIDEP Requirements Guide	
Place/Time/Purpose of Delivery: -Existing Alert Submittals: Deliver disposition of existing Alerts to the Project Office within thirty (30) days of identification of potential use, or use, of an EEE part or material for review. -New/Subsequent Alert Submittals: Deliver disposition of subsequent Alerts, that shall be provided by the Project Office, regarding EEE parts or materials that have been already approved for use to the Project Office within thirty (30) days of Alert receipt for review.	
Preparation Information: The Contractor shall use the Program Approved Parts List (PAPL) (DID MA 11-3), the As-Designed Parts List (ADPL) (DID MA 11-4), the As-Built Parts List (ABPL) (DID MA-5), and the Materials Identification and Usage List (MIUL) (DID MA 12-4) to prepare this deliverable. The Contractor shall submit the following: -For Existing Alert Submittals: Compare the list of existing Alerts against the the Lists noted above, inserting a notation for each line item as to whether there are applicable Alerts. -As new parts and materials are added to the PAPL, ADPL, ABPL, or MIUL; update	

the affected list with GIDEP information.

- For New/Subsequent Alert Submittals: Update the PAPL, ADPL, ABPL, or MIUL with Alert information as the Contractor is notified about new Alerts by the Project Office and/or GIDEP.

- Complete a GSFC Form 4-37, "Problem Impact Statement Parts, Materials and Safety," or equivalent Contractor form, for Alerts provided by the GSFC Project Office. (See Appendix C for form information.).

DID MA 15-2 DOCUMENTATION ON SIGNIFICANT PARTS, MATERIALS, AND SAFETY PROBLEMS (04-18-2008)

Title: Documentation on Significant Parts, Materials, and Safety Problems	DID No.: MA 15-2
Reference: MAR Paragraph 15.4	
Use: Document the Contractor's identification of significant parts, material, and safety problems and the Contractor's actions as required by the GIDEP manual regarding the decision to prepare an Alert, including the type of Alert that is applicable.	
Related Documents: - S0300- BT-PRO-010, GIDEP Operations Manual -S0300-BU-GYD-010, GIDEP Requirements Guide	
Place/Time/Purpose of Delivery: -Deliver to the Project Office within thirty (30) days of identification for review.	
Preparation Information: The Contractor shall submit relevant information (e.g., failure analyses, test reports, root cause and corrective action evaluations).	

DID MA 16-1: END ITEM ACCEPTANCE DATA PACKAGE (04-18-2008)

Title: End Item Acceptance Data Package	DID No.: MA 16-1
Reference: MAR Paragraph 16.1	
Use: The End Item Acceptance Data Package documents the design, fabrication, assembly, test, and integration of the hardware and software being delivered and is included with the end item delivery.	
Related Documents: None	
Place/Time/Purpose of Delivery: Deliver to the Project thirty (30) days prior to end item delivery for approval.	
Preparation Information: The Contractor prepares the End Item Acceptance Data Package as part of design development and implementation such that it is completed prior to delivery. The following items shall be included: - The deliverable item name, serial number, part number, and classification status (e.g., flight, non-flight, ground support, etc.). - Appropriate approval signatures (e.g., Contractors quality representative, product design lead, Government Representative, etc.). - List of shortages or open items at the time of acceptance with supporting rationale. - As-built serialization. - As-built configuration. - In-process Work Orders (available for review at Contractors--not a deliverable). - Final assembly and test Work Order. - Nonconformance reports. - Acceptance testing procedures and report(s), including environmental testing. - Trend data. - Anomaly/problem failure reports with root cause and corrective action dispositions.	

- As-built EEE parts list.
- As-built materials list.
- Chronological history, including:
    - Total operating hours and failure-free hours of operation; and
    - Total number of mechanical cycles and remaining cycle life.
- Limited life items, including data regarding the life used and remaining.
- As-built final assembly drawings.
- PWB coupon results.
- Photographic documentation of hardware (pre and post-conformal coating for printed wiring assemblies, box or unit, subsystem, system, harness, structure, etc.).
- Waivers.
- Certificate of Compliance which were signed by management.